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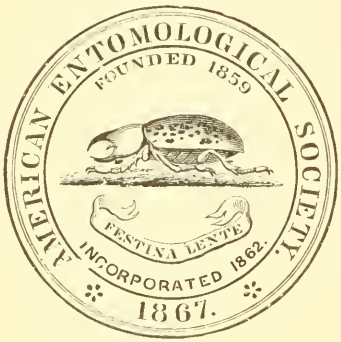

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ERRATA.

Page 195, line 24, for 43, *read* 44.
" 198, line 13, for forward, *read* posteriorly.
" 202, line 11, for posteriorly, *read* anteriorly.
" 208, bottom line, for forward, *read* posteriorly.

TRANSACTIONS

OF THE

AMERICAN ENTOMOLOGICAL SOCIETY.

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ANNOTATED LIST OF THE PENTATOMIDÆ Recorded from America North of Mexico, with descriptions of some new species.

BY EDWARD P. VAN DUZEE, Buffalo, N. Y.

For several years past I have been making special efforts to increase my collection of Pentatomids from all parts of the world. Of the species thus far recorded from America north of Mexico, I have been able to secure examples of all but a few, and some of those still wanting in my collection may yet prove to be synonyms of other better known forms. I venture to publish the present notes to put in more permanent form certain observations I have made on our species, and to record additional localities and the range of some of the species as known to me. I am aware that these notes are very fragmentary and that many other species from the West Indies and Mexico doubtless invade our southern border. Records of such additional species, including those from Florida, Texas, Arizona and the Pacific coast, are greatly to be desired, and it is partly in the hope of stimulating the publication of such notes that these fragments have been put in print.

I have quoted largely from the writings of Dr. P. R. Uhler. Too much cannot be said in praise of the work done by Dr. Uhler. In almost every case it is accurate and concise and throughout is remarkably free from errors due to hasty work, and, what is still more rare in work of this character, it has a literary style that makes it delightful reading with which to pass an idle hour. Dr. Uhler's work needs no praise from me. It has been an inspiration

to me in all my studies on the Hemiptera, as has his kind and ready assistance on every occasion on which I have sought it; and I esteem it an honor and privilege to dedicate to him these somewhat disconnected and incomplete notes on our North American Pentatomids.

To make this list more generally useful, I have, in some genera, prepared synoptical tables of the species, intended to apply only to those here enumerated. I have also tried to indicate where the best synopses of the genera in the several subfamilies may be found, and have added references and synonymical notes to supplement and correct those in the Lethierry and Severin Catalogue, the generic arrangement of which I have followed. In a few cases it has seemed advisable to add a short diagnosis of species published in works inaccessible to many of our students.

It has been found impossible, in all cases, to give proper credit to the friends who have sent me material for study or who have kindly allowed me to retain from such material valuable specimens that were still wanting in my collection. I will ask pardon in advance for such omissions, with the assurance that they were entirely unintentional.

This list records the occurrence of 191 species in the United States and Canada, a few of which are still unrecognized by our modern students and may not be valid species. Twenty-eight species of those here listed are still unrepresented in my collection, but twelve of these belong to the *Cydnidæ*, a subfamily in which I have done little work. I have indicated these species by an asterisk. One variety and twelve species are here described as new.

In the arrangement of the subfamilies I have followed the sequence and ordinal rank assigned to them in Lethierry and Severin's Catalogue Général des Hémiptères. The generic synonomy established by Bergroth in the Revue d'Entomologie, x, p. 235, 1893, has, in every case except *Orsilochus*, been rejected by Lethierry and Severin, and I have not adopted it here.

The Pentatomidæ form a natural group which is generally placed at the head of the Heteropterous Hemiptera. They are ordinarily known as "stinck bugs" or "berry bugs," and may be roughly distinguished by their oval or lozenge shaped bodies, five-jointed antennæ, and large triangular scutellum, which may become half-oval, very convex, and cover the entire abdomen.

Family PENTATOMIDÆ.

A brief synopsis of our four main subfamilies may be found in Comstock's Manual for the Study of Insects, page 128, where, however, they are given family rank. In using this, allowance must be made for certain aberrant forms in the subfamily Asopidæ, etc., in which the scutellum covers almost the entire abdomen, as it does in the Corimelænidæ and Scutelleridæ. For other synopses see: Stal, Hemiptera Africana, i, p. 32; and Genera Pentatomidarum Europæ disposuit, in Of. Kong. Vet.-Akad. Förh., xxix, no. 3, p. 31, 1872 (from both of which the Cydnidæ, including the Corimelænidæ, are excluded); Fieber, Die Europaischen Hemiptera, p. 26 (giving family rank to the Cydnidæ and Tetyræ); and Amyot and Serville, Hemipteres, p. xv *et seq.*

Subfamily CORIMELÆNIDÆ.

This family is united with the *Cydnidæ* by Fieber and Stal, and is placed in a group, *Odontoscelides*, with genus *Odontoscelis* by Amyot and Serville (p. xix). Dr. Uhler separates it as a distinct family under the name used here, and in the Lethierry and Severin Catalogue it is placed as a subfamily under the same name. There is but one genus in our fauna.

Genus **CORIMELÆNA** White.

The following synopsis is founded on the more obvious characters as I have been able to make them out. Unfortunately, many of them are comparative, but with the more common species in hand, such as *unicolor*, *nitidulоides*, *lateralis* and *pulicaria*, which will be found in almost every collection, the species should be located with reasonable certainty.

C. denudata Uhler and *marginalis* Dallas are omitted, as I have not seen specimens and cannot locate them by the published descriptions.

Color ferruginous, becoming blackish anteriorly, the broad elytra and sides of the pronotum white ..... **Sayi.**

Color black or blue; elytra with or without white markings ..... 1.

1. Elytra concolorous, not marked with white 2

Elytra marked with white or yellow ..... 8.

2. Color deep steel-blue, polished, rather obscurely punctured; form oval, somewhat narrowed posteriorly; antennæ pale, pronotum with two distinct impressed points anteriorly ..... **cærulescens.**

Color black, sometimes with blue, purple or bronze reflections ..... 3.

3. Short oval or almost hemispherical; whole surface closely punctate; color deep black, opaque or somewhat polished ....4.
Form oval or more or less narrowed posteriorly, surface polished, punctures distinct or almost obsolete.....5.
4. Form very short and broad, rounded behind, a little produced before; body distinctly ciliate all around; surface opaque..... **ciliata.**
Form short oval, somewhat polished above, but closely punctured and transversely wrinkled on the pronotum and base of the scutellum; sides not ciliate..... **nigra.**
5. Surface highly polished, punctures almost obsolete on the surface above; form regularly oval; size large, 5 to 6 mm..... ..... **unicolor.**
Surface polished, distinctly punctured; form more or less narrowed posteriorly .....6.
6. Sides of the pronotum strongly depressed, the narrow recurved edge becoming obsolete before the polished tubercular humeri .. ...**anthracina.**
Sides of the pronotum less abrupt, the narrow recurved edge continued around the humeral angle, humeri not polished and tubercular.....7.
7. Size larger (4–4½ mm.); apex of the head not recurved; inner sector of the corium distinctly bent inward near the middle, leaving a punctured surface between it and the costal nervure.....**nitiduloides.**
Size smaller (4 mm.); apex of the head distinctly recurved; inner sector of the corium about parallel with the subcostal nervure.**nitiduloides** var.
8. Corium yellowish with a black spot before the apex; edge of the pronotum and abdomen ciliate (Uhler) .... **obtusa.**
Corium black marked with white or yellow.....9.
9. Corium with a large white spot covering the base; size large (4 mm.). **renormata.**
Corium bordered without, sometimes broadly, with white or yellow.. . 10.
10. White margin of the corium narrowed basally, not passing the subcostal nervure; costal edge tumid, impunctate .....**Gillettii.**
White margin of the corium extended inwardly at base in conformity with the basal sinus of the scutellum.....11.
11. Form elongated, narrow; length 3 to 3½ mm.; surface strongly punctured, polished; exposed portion of the corium almost entirely pale or orange. **extensa.**
Form broader, ovate; pale margins of the elytra narrower .....12.
12. Size rather large, about 4 mm.....**lateralis.**
Size smaller, about 2½ mm ....**pulicaria.**

Corimelæna unicolor P. B (*helopioides* Wolff, and *atra* A. & S.).

For this species I have followed the identification given by Dr. Uhler in Proc. Boston Soc. Nat. Hist., xix, p. 366, 1878, but have used the name adopted by Lethierry and Severin under the supposition that it is founded on a later comparison with the types. This is our largest *Corimelæna* and seems to be most at home in the northeastern states, where it is found singly on weeds and grass in damp situations. It may be best distinguished from *nitiduloides* by

its regularly oval form and its more highly polished surface, with fewer and almost obsolete punctures. I have taken it as far west as Kansas. It ranges in Canada from Quebec to Manitoba.

Corimelæna nitiduloides Wolff (*histeroides* Say).

Compared with *unicolor*, this species is obviously more narrowed posteriorly; it will average a little smaller; the edge of the scutellum at base is a little more deeply excavated, and the coriaceous portion of the elytra is perhaps a little broader and more thinned out inwardly than in *unicolor*. In *nitiduloides* the punctures are deeper and closer, so the upper surface although shining black wants the highly polished look so noticeable in *unicolor*. In *unicolor* the antennæ are longer and stouter, with the apical two joints darker than in *nitiduloides*. In the males the sixth ventral segment is extended forward in a more acute angle in *unicolor*, and in the females of that species the basal plates of the genital segment are distinctly longer on the middle; in *nitiduloides* they are cut almost square across.

This species seems to be more characteristic of the western fauna, although it is found occasionally throughout the east. Among the foot hills near Fort Collins, Colo., last summer, Prof. Gillette and I took it in great numbers from a low weed, *Plantago Purshi*. They were resting on the flower spikes in all stages of development. Perhaps one half of these were covered with a dusky "bloom" that washes off with benzine, and when present gives them a dull bluish-black appearance. This condition may be owing to an accumulation of the pollen of the plant on the surface, but it seems to me more likely that it is connected with the breeding season, as is the "bloom" often found on certain species of *Euschistus*. This species extends its range into Mexico and Guatemala, according to Dr. Distant.

Corimelæna nitiduloides var.

I have in my collection two examples of what I prefer for the present to consider as a variety of this species. It is smaller, more highly polished, and with the punctures less distinct. The head is depressed before the middle, leaving the apex distinctly recurved, and the outer sector on the corium is almost parallel to the subcostal nervure. I took one specimen near Buffalo and the other in New Jersey.

Corimelæna nigra Dallas.

This species, as I have located it, is broader and shorter than *nitiduloides;* the punctures are stronger and closer, leaving the surface more opaque; the pronotum and base of the scutellum are transversely wrinkled; there is a well-defined smooth area occupying the position of the callosities; the base of the scutellum is more deeply excavated on either side, and above this the surface is more strongly impressed.

In July of last year I swept three examples of this species from the dry prairies about Fort Collins, Colo. Another specimen, received some years ago from a correspondent in Canada, is more strongly punctured and wrinkled and is slightly tinged with purple above.

Corimelæna anthracina Uhler.

Under this name I have placed a species from Vancouver Island, of which I have received two specimens from Rev. G. W. Taylor, and have seen others taken by Prof. F. H. Snow in New Mexico, and by Prof. Aldrich in Idaho. In form these most resemble *unicolor*, but they are smaller and more convex above, and the punctures are stronger and more uniformly distributed even than in *nitiduloides.* They may be best distinguished from their nearest relatives by the sides of the pronotum, which are more vertical, with the narrow reflexed margin abbreviated before the tumid impunctured humeri. In the prominent humeri and the style of punctuation this species approaches *nigra*, but the broadly ovate form of the latter will at once separate them.

Corimelæna ciliata Uhler.

This species is even shorter and broader than *nigra*, being almost hemispherical, but a little angularly produced before. The upper surface is opaque, deep black with a tinge of purple. It is very closely and deeply punctured and quite distinctly transversely wrinkled on the disk of the pronotum and scutellum. The fringe of conspicuous ciliæ about the body and the short and broad corium are other characters that will serve to distinguish this species.

In July, 1903, I took one example of this very distinct species on the dry prairies, near the Leyden coal mines, just west of Denver, Colo. Another specimen was kindly presented to me by Prof. F. H. Snow, who took it in Morton County, Kan., and Mrs. Slosson has sent me an example taken at Lake Worth, Fla.

Corimelæna cærulescens Stal (*cyanea* Uhler.)

I possess one specimen of this species taken in Arizona and kindly given to me by Dr. Uhler, and the Museum of Comp. Zool. has an example taken at San Bernardino, Cal.

It is allied in form and size to *nitiduloides*. The punctures are finer or almost obsolete on the disk of the pronotum and scutellum; the sides of the scutellum are strongly impressed and coarsely punctured at base; the coriaceous portion of the elytra is broad at base, with the inner edge sinuated to the acute apex; and the antennæ are pale, with the apical joints hardly darker. The steel-blue reflections over the whole insect are very noticeable and apparently characteristic. My specimen does not answer very well to the description given by Dr. Uhler of his *cyanea*, and with sufficient material the two forms may prove to be distinct.

Corimelæna denudata Uhler.

I have seen nothing that agrees with Uhler's description of this species. It must be closely related to *nitiduloides* and *unicolor*. The type was from Louisiana.

Corimelæna lateralis Fabr.

This well known species has been recorded from almost all parts of the United States. I have never taken it about Buffalo, nor have I received it from other localities so far to the northeast as this. West of the Mississippi it seems to be very widely distributed and common. I swept it in large numbers from a grass-patch far up in Williams' Canyon, near Ogden, Utah, at an altitude of about 7000 feet, in July, 1900, and from Prof. Wickham I have received two unusually large examples taken at Wanatchee, Wash. Distant, in the Biologia, records the occurrence of a Mexican example wanting the white border to the corium, and Uhler records the same peculiarity in certain specimens taken by him in the east. It is, however, just possible that a careful comparison would show these to be distinct from the true *lateralis*. In all the specimens I have seen the white border to the corium is expanded within to correspond with the sinus at the base of the scutellum. The whole upper surface in this species is very regularly and distinctly punctured, with a narrow, transverse, smooth area over the callosities, and the apical margin of the abdomen is marked with two elongated whitish spots on each side. In some examples there is a suggestion of a smooth

longitudinal median line above. The anterior extension of the sixth ventral segment in the female is distinctly rounded, with scarcely an indication of an angle, and the truncated posterior margin has a slight tooth-like projection at the middle.

Corimelæna Gillettii, n. sp.

Closely allied to *lateralis* but larger. Head proportionately broader, shorter, and less convex transversely, with the surface more coarsely punctured and the margins less deeply sinuated. Ocelli whitish or uncolored, not rufous as in *lateralis*. Extreme apex of the tylus inferiorly white, in *lateralis* entirely black. Form of the pronotum as in *lateralis* but with the surface before and behind the humeral angles more impressed, the disk posteriorly not so strongly punctured and the smooth area over the callosities less defined. Scutellum with weaker punctuation on the disk, and with a slender carinate margin adjacent to the inner edge of the elytra, defined within by an impressed line. In *lateralis* the surface is punctured to the extreme edge. Elytra black with a narrow smooth costal vitta, widest at its truncated apex and slightly narrowed toward its base. Edge of the abdomen with a strong yellow line on the sixth segment, and in the female a similar line on the genital segment. Apex of the sixth ventral segment in the female regularly arcuated, not sinuated with a slight median tooth as in *lateralis*. Legs piceous, knees paler. Antennæ rostrum and tarsi rufo-castanous.

Described from two female examples in my own collection, one of which I swept from weeds by the railroad track at Cape May Court House, N. J., August 21, 1902, the other received several years ago from a correspondent in Canada, without locality; and a good series received from Prof. Herbert Osborn, taken at Bay Ridge, Md.; Washington, D. C.; Ironton, Ohio; and South McAlester, Ind. Terr. (Wickham). Two males from Dallas, Texas, differ only in being proportionately narrower and a little smaller. This seems to be the eastern representative of the more western *lateralis*. Considering the localities from which Fabricius doubtless received his American material it would seem more natural to reverse these two species (*lateralis* and *Gillettii*), but his description of the elytra of his species cannot be construed to apply to the present form. For first recognition of this species the larger size (about 4 mm.) and the form of the white costal vitta on the corium will be found most useful.

It gives me pleasure to dedicate this species to Prof. C. P. Gillette, whose services in bringing once more to light the long lost *Corimelæna albipennis* Say deserves recognition, and whose generous assistance I have had reason to appreciate more than once while prosecuting my work on the Hemiptera.

***Corimelæna marginella** Dallas.

This species I have been unable to identify with any form I have yet seen from North America. Distant figures the type at plate 30, fig. 1, of the Biologia. Judging from this figure and from the description by Dallas, it must be very close to *pulicaria*. The type was from Hudson's Bay, and Distant records its occurrence in Mexico.

Corimelæna pulicaria Germar.

This very common and widely distributed insect needs no extended notice. It is the smallest species yet recognized from within our limits, but it shows some variation in size as well as in the width of the pale margin of the elytra. Sometimes the color on the corium is deepened almost to orange. Redescribed as *Galgupha flavo marginata* by Cyrus Thomas in Trans. Ill. State Ag. Soc., v, p. 455, 1865.

Corimelæna extensa Uhler.

This species, as I have located it, seems to be quite widely distributed in the Rocky Mountains. It is closely allied to *pulicaria*, but is a little larger, much more elongated in form, the head is longer and more triangular, and the antennæ are paler in color, with the apical joints shorter and more slender. It has an obscure pale line on the edge of the sixth ventral segment, but none on the genital segment as in *pulicaria*. Most of my Colorado specimens are smaller than the measurements given by Dr. Uhler and have the elytra orange in place of pale yellow. The narrow black stripe mentioned by Uhler follows the contour of the scutellar margin.

I swept this insect in great numbers from a low labiate plant on the high prairies close up to the foot of Green Mountain, at Boulder, Colo., in July, 1903. I have also taken it in the same State at Pueblo and Fort Collins. Prof. Wickham has sent me specimens taken on Inyo Mountains, Cal., at an altitude of about 8000 feet, and Rev. G. W. Taylor has taken it in Vancouver Island in May. Dr. Uhler records it from Dakota, Oregon, California, Utah, Arizona and Mexico. Mr. C. H. T. Townsend reports it on wild tobacco in Arizona (Psyche, vi, 547, 1893). I have never seen dark green specimens, such as he describes.

Corimelæna renormata Uhler. Hemiptera of Colorado, p. 11, 1895.

Of this very distinct species I have three specimens in my collec

tion. Two of these I took on the dry prairies, at the Leyden mines, near Denver, Col. The other was taken at Boulder, Col., and kindly given to me by Rev. M. Wirtner. One of the Denver specimens is immature and is colored almost exactly as described by Dr. Uhler under *C. albipennis* Say in the Hemiptera of Colorado, p. 10. In form and markings *renormata* closely resembles *basalis* Germ. from South America, but it is only about one-half the size of that species, and it is well distinguished in other respects.

Corimelæna Sayi nov. nom. (*albipennis* Say, preöc.).

While looking over the very excellent collection of Hemiptera in the Agricultural College at Fort Collins, Col., last summer, I was delighted to find a fine pair of these insects that had been captured in the foot hills about thirty miles northwest of the College. Prof. Gillette very generously gave me one of these specimens for study. Comparing this with the description of *albipennis* given by Uhler in the Hemiptera of Colorado, it becomes evident that the specimen before Dr. Uhler was not *albipennis* at all, but the immature form of *renormata*, as suggested by him. The present specimens correspond with Say's description in every detail. The head is rather long and well rounded before, with the sides very feebly sinuated; antennæ soiled yellow, with the apical joint longer than in *renormata*. Pronotum flatter than usual in this genus, strongly narrowed before, blackish, with the basal disk broadly castaneous, and the broad lateral margins white and calloused, humeral angles rather prominent. Scutellum short and broad, apex regularly rounded, base deeply excavated at the sides; color castaneous, remotely punctured with blackish, and with a blackish impressed area at each basal angle. Coriaceous portion of the elytra when closed very broad, white, with a short black longitudinal streak placed behind the middle and near to the inner margin. Venter very dark castaneous, with the edges interruptedly thickened and rufous; breast black; legs brown, tarsi pale. The punctuation of the upper surface is rather shallow and almost concolorous on the disk of the pronotum and scutellum. In form this species most nearly resembles *ciliata*.

These individuals and another sent by Prof. Gillette to Prof. Herbert Osborn and recorded by him in Ent. News, iv, p. 91, 1893, and Proc. Iowa Acad. of Sciences, vol. i, pt. 4, p. 121, 1894, are, so far as I can learn, the only known specimens. Unfortunately

Say's name for this species was preoccupied by *C. albipennis* Esch. from Chili, published ten years earlier; I have therefore substituted for it the name of the illustrious naturalist who first described it.

***Corimelæna obtusa** Uhler. Hemipt. of Lower Calif., Proc. Calif. Acad. of Sci., Ser. 2, iv, p. 225, 1894.

I have never seen this species, which was described from specimens taken in Lower California and therefore not really belonging to our fauna. Judging from Uhler's description, it must be very closely related to *Sayi* in some of its characters.

Family SCUTELLERIDÆ.

A good synopsis of the American genera of this subfamily is given by Stal in "Bidrag till Hemipterernas systematik" in Of. Kongl. Vet.-Akad. Förh., xxiv, no. 7, p. 491, 1867, under the name *Tetyridæ*. They are listed in the Enumeratio Hemip., i, p. 4, 1870. Germar's Monograph, in his Zeits. fur Ent., vol. i, pt. 1, pp. 1–146, 1839, although old, is quite indispensable in the study of this family.

Tetyra bipunctata H. S.

My specimens are from Maryland and Washington, D. C. Its recorded range includes Texas, Mexico and Lower California.

***Tetyra arcuata** Fabr.

Mrs. Slosson has kindly sent me for study an individual of this species taken at Biscany Bay, Fla. It is almost as light in color as *fureta*, but rather more tinged with grey. The markings are about the same as those of *bipunctata*, but it can be readily distinguished from that species by the shorter head, the black antennæ, banded with white at each incisure, and the short rostrum, which reaches only to the middle of the second ventral segment, while in *bipunctata* it reaches well on to the fifth segment. This is the first recorded occurrence of this insect in our territory, unless Uhler's *robusta* should prove to be a form of the same.

***Tetyra robusta** Uhler. Trans. Md. Acad. of Sci., i. p. 383, 1897.

Dr. Uhler describes this species from material taken in Arizona and Mexico, and suggests its relationship with *arcuata* Fabr. I have not seen it.

Pachycoris torridus Scopoli.

Uhler gives California as a habitat for this species under the name *Fabricii*, and describes it from Lower California under the name *Stallii*. In the Lethierry & Severin Catalogue it is accredited to California. It seems to me not improbable that the above references to "California" really refer to Lower California, a province of Mexico, and therefore excluded from the faunal limits of the present list.

Orsilochus guttatus H. S.

Dr. Uhler has been kind enough to give me a specimen of this species that was taken in Florida. Mrs. Slosson has taken it in the same State, and the Museum of Comparative Zoology has it from South Carolina.

Diolcus irroratus Fabr.

Mrs. Slosson has kindly sent me for examination one specimen of the form named *flavescens* by Westwood, that she took in southern Florida. This form of *irroratus* approaches *Boscii*, but may be distinguished by its more convex form, the absence of the metallic punctures on the sides of the pleuræ, etc. It makes an interesting addition to our fauna.

Diolcus chrysorrhœus Fabr.

Say described this species, as *viridipunctatus*, from Florida, and Uhler records it from South Carolina and Mississippi, and Mr. Henshaw has sent me several that were taken in Texas. It may be distinguished from *Bosci*, which it resembles in color, by its being much more convex.

Genus **AULACOSTETHUS** Uhler.

This genus is not included in Stal's Synopsis. It closely resembles *Diolcus*, and has the bisulcate tibiæ of that genus, but may be distinguished by having the osteolar canal long and slightly curved, with an obtuse apex.

Aulacostethus marmoratus Say.

The only specimens I have of this species were sent to me from Georgia by the former State Entomologist, Mr. W. M. Scott. It has been recorded from New Jersey, Maryland, and North Carolina, and Mr. Henshaw has sent me specimens taken at Dallas, Tex.

***Alaeostethus simulans** Uhler.

Recorded from California only. I have not yet seen it.

Genus **HOMŒMUS** Dallas.

The following key refers only to the four species known to me:

Dilated anterior margin of the prostethus when viewed vertically from below forming a distinct but obtuse angle beneath the antenniferous tubercles; posterior half of the lateral margin of each ventral segment black ..... **proteus.**

Dilated anterior margin of the prostethus rounded ..... 1.

1. Osteolar canal regularly curved at apex, not abruptly bent; size small, color pale ..... **grammicus.**

Osteolar canal abruptly bent forward at apex nearly parallel to the outer margin of the metapleura ..... 2.

2. Latero-anterior margins of the pronotum concavely arcuated; anterior prolongation of the 6th ventral segment broader, distintly angled; head generally bronze-black, without pale markings ..... **æneifrons.**

Latero-anterior margins of the pronotum straight or feebly convexly arcuated; anterior prolongation of the 6th ventral segment narrower, distinctly rounded; head generally with a broad submarginal pale vitta. **bijugis.**

Homœmus æneifrons Say.

This is a widely distributed and in some localities an abundant species. I have never been able to detect it about Buffalo, but have taken it in numbers at Lake Placid in the Adirondacks. It occurs all through New England, and in Canada it is distributed from Quebec to Vancouver Island. In the Rocky Mountains it spreads southward to New Mexico, where it has been taken by Dr. Skinner, and Distant records it from Mexico. On the eastern side of the continent it extends along the Alleghany Mountains into Maryland and Virginia.

Homœmus bijugis Uhler.

This species is very close to the preceding. After a careful examination of a long series of specimens from various localities, I have, however, found two characters that seem quite constant, and may perhaps serve for separating these forms. In *æneifrons* the anterior prolongation of the sixth ventral segment is distinctly broader, with the angles more pronounced, and in the male with its anterior margin feebly produced in the middle. In *bijugis* this anterior prolongation is narrower and more rounded before. In *bijugis* also the submargins of the head have a broad, pale vitta, and the general color is paler, with the markings above more clearly

defined, and beneath the punctures are paler or quite uncolored. The edge of the abdomen beneath is plainly marked with black points at the incisures in *æneifrons*, while in *bijugis* these black points are nearly or quite absent. In size these species present about the same range: from 6½ to 9 mm.

This species seems to be an inhabitant of the arid plains bordering the Rocky Mountains. I have taken it wherever I have collected in such situations in Colorado and Utah, and have received specimens taken by Prof. Wickham at Carson City, Nev. Dr. Uhler records it from as far east as Dakota and Nebraska and Prof. Osborn from Iowa.

Homœmus grammicus Wolf.

This is the smallest species of Homœmus known to me. The males in my collection measure 4½ mm. in length, the females 6 mm. In color and markings it closely resembles *bijugis*, but may be distinguished by the more gently curved osteolar canal, a somewhat variable character however, and the form of the genital segment in the male, which is regularly arcuated in *grammicus*, and truncated or feebly concave in *bijugis*. In *grammicus* the head is narrower anteriorly, less convex, of a deep black color, hardly bronze-black, as in *bijugis*, and the punctures are finer. The broad, pale submarginal vitta is present as in *bijugis*. The pronotum differs in having the humeri decidedly more prominent and subacute. On the scutellum the lateral brown vittæ are less curved within and are discernible to the lateral margin, which is hardly true of *bijugis*. The males in my possession are as clearly marked as are the females, which is not the case in the allied species.

This species is more southern in its range than *æneifrons* and *bijugis*. It occurs from North Carolina south to Florida and west to Texas and Mexico. My own specimens were taken in Kansas by Mr. Crevecouer. It is also included in Gillette and Baker's List of the Hemiptera of Colorado.

***Homœmus consors** Uhler.

Dr. Uhler's description of this species seems to be incomplete, as it fails to mention the size of the species or the locality of capture. I have seen nothing that would answer to this description, and it has never been mentioned by later writers on our Hemiptera. It would seem to be rather closely allied to *grammicus*.

Homœmus proteus Stal.

I am indebted to the generosity of Prof. H. F. Wickham for three strongly marked Texan specimens of the "var. d," as described by Stal in Stet. Ent Ziet., xxiii, p. 82, 1862. I can find no other record of its having been found within our territory except in Prof. Osborn's List of the Hemiptera of Iowa. It is just possible that this reference is an error either of determination or locality. I have in my collection one specimen of "var. a" Stal, taken in Costa Rica. The recorded southern range of this species reaches to Columbia. More recently Mr. Henshaw has informed me that the Museum of Comparative Zoology has an example taken at St. Barbara, California.

This species exhibits the same range of variation in marking that we find in the other species of *Homœmus*, *Sphyrocoris*, *Symphylus*, *Dioleus* and, in a modified form, in *Eurygaster*. From *Homœmus æneifrons* and *bijugis* it differs in being smaller, more convex above; the scutellum is broader behind the middle but narrower at tip; the head is broader and more convex toward the apex, with a pale stripe down the middle of the tylus and a broader one on each cheek, at apex separated from the median vitta by the narrow black margins of the tylus. The pronotum is more convex, especially toward the sides, which are straight and very narrowly reflexed; the humeral angles are less prominent; the elytra, when spread, show a large angular black spot interior to the apex of the coriaceous portion which is not indicated in the allied species. Beneath the colors are much darker and the posterior half of the lateral margin of each segment is black.

Sphyrocoris obliquus Germ.

Most of my material in this species has been received from Hayti and Costa Rica, but I have seen a few specimens taken in southern Florida by Mrs. Annie Trumbull Slosson, and Dr. Uhler records it from Arizona. This insect presents the same general pattern of marking seen in *Homœmus æneifrons* and *bijugis*.

Genus *Sphyrocoris* may be distinguished from *Homœmus* by its having the osteolar canal broadly expanded and bent at right angles toward the apex, the surface there being punctured and the borders ill defined from the surrounding disk of the metapleura. In *Homœmus*, while the apex of the osteolar canal is sometimes quite ab-

ruptly bent, its surface is impunctate, with well defined borders, and its form is narrow, almost linear, throughout. In *Symphylus* from South and Central America, in which the pattern of marking is much the same, the osteolar canal is short and straight. *Diolcus* is a broader form, with bisulcate tibiæ, and the osteolar canal barely longer than broad. *Camirus* has the pronotum transversely impressed across the middle, while in *Odontoscelis* the osteolar orifice is wanting and the whole insect is clothed with matted hairs.

Camirus porosus Germ.

Of this small black species I have seen one specimen, taken in Florida by Mrs. Slosson, and another from the same State was kindly given to me by Mr. Otto Heidemann. Dr. Uhler records it from California and Texas, and the Museum of Comparative Zo ology has an example from Vancouver.

***Camirus consocius** Uhler.

Dr. Uhler describes this species under genus *Zophoessa* from Arizona. I have not yet seen it.

Of the described species of *Camirus* not found in our territory, I have seen only *conicus* from British Guiana. This is a brown species, marked much as in *Sphyrocoris obliquus* Germ. *Camirus socius* Stal seems to be most nearly allied to *conicus*, while *moestus* Stal is a larger black species. Both are from Mexico.

***Acantholoma denticulata** Stal.

Described from Illinois. I have not yet seen it.

Phimodera torpida Walker.

The only specimen of this species I have seen was kindly given to me by Rev. M. Wirtner, and bears a label "Boulder, Colo." It is of a dark fuscous color, marked with a pale semicircular patch, circumscribed with blackish, on the base of the scutellum at either side. The surface is minutely dotted with pale, and there is an obsolete pale median line above.

***Phimodera binotata** Say.

I have never seen anything I could locate as this species. Judging from Say's description it must be very near to *torpida*.

Phimodera corrugata n. sp.

Size of *P. torpida* Walker. More convex above, broader, almost truncated behind; shoulders prominent, tumid, and the whole upper surface roughly cor-

rugated. Color dull brown, varied with ash grey and ferruginous, and covered in places with a close grey pubescence. Head more strongly deflexed than in *torpida*, with the cheeks more tumid above and narrower at apex, their sides very feebly sinuated; surface of the head blackish clothed with greyish pubescence, the tumid disk of the cheeks and tylus obscure fulvous. Antennæ rather slender, black with pale incisures, basal joint very short, second about as long as the fourth, reaching about to the apex of the head, third scarcely longer than the basal, fifth longest. Rostrum black, reaching to the base of the abdomen. Pronotum very uneven, strongly constricted a little before the middle; posterior lobe moderately convex, with a median and two somewhat irregular longitudinal carinæ on either side, all of which are common to the anterior lobe, where they diverge a little; anterior lobe convex on the middle, this elevated portion transversely impressed and forming almost a hood over the base of the vertex; surface more depressed toward the anterior angles, the sides deeply sinuated, forming a right angle before the prominent tumid shoulders; the surface is pale on the posterior lobe and raised areas, and blackish in the depressions of the anterior lobe. Scutellum subquadrate, broadly rounded behind, not quite covering the connexivum; surface roughly pitted and corrugated, with an uneven semicircular carina at base enclosing a depressed area which is bisected by the subcarinate medium line, this line forms a tubercle at base and connects with a square apical area; surface a little depressed at base near the lateral margins. Pleural pieces black, greyish pubescent, the prominent shoulders forming an angular projecting shelf on either side beneath. Venter blackish brown, sparcely grey-pubescent, with a row of pale spots within the stigmata, and a whitish tubercle at each incisure on the edge of the abdomen. Legs black, knees and a broad band on each tibia pale. In fully colored examples there is a pale basal patch on either side of the disk of the pronotum, another on either side of the base of the scutellum invading the exposed base of the corium, a square spot on the scutellum circumscribed with blackish, and an indefinite area anterior to this. All these areas are ill-defined except the square apical patch. The pale median carina is generally well defined and intensified by darker on either side. Length, male 5 mm.; female 6½ mm.

Colorado. Described from two male and four female examples taken at Fort Collins, in June and August, by my good friend, Elmer D. Ball. Those taken in June were accompanied by their pupa cases, indicating that they reached maturity at that season. *Phimodera torpida* is less convex both above and below, the body is more narrowed posteriorly, the pronotum is more feebly impressed and not so strongly elevated over the base of the head, the sides are much less deeply sinuated, and all the irregular carinate lines and corrugations that cover the whole upper surface in *corrugata* are wanting. In both *torpida* and *corrugata* the posterior trochanters are unarmed. I regret that it has been impossible for me to compare *corrugata* with the descriptions of some of the Siberian species published by Jakowleff.

Eurygaster alternatus Say.

This is probably the most abundant and universally distributed Scutellerid found in North America. It is common throughout the northern States and Canada and is perhaps equally abundant in the Rocky Mountain region south to New Mexico and west to California. On the eastern side of the continent, according to Dr. Uhler, it is rarely found so far south as Maryland. I once took it in great numbers from the sedges on the flats bordering Quinipiac River, near New Haven, Conn., and everywhere it shows a preference for swampy spots. This species varies much in size,—6½ to 10 mm. in my material,—and equally in the distinctness of its markings. Some individuals are quite strongly suffused with pink, and frequently the dark alternations on the connexivum are nearly or quite obsolete.

Eurygaster carinatus n. sp.

Form of *hottentotus* nearly, a little smaller, but distinctly larger than *alternatus*, depressed, triangular before, scutellum with a tumid base and carinate line. Color testaceous grey, becoming ochraceous on the abdomen, disk of the pronotum closely dotted with smooth pale points some of which become confluent. Head triangular, more obtuse and less incurved than in *hottentotus*, sides very slightly concave, surface almost flat, regularly punctate; tylus reaching almost or quite to the apex of the head. Rostrum attaining the posterior coxæ. Antennæ rufous brown or fuscous, second, third and fourth joints subequal, fifth longest. Pronotum depressed, the latero-posterior edge deeply arcuated behind the prominent and subacute humeri, latero-anterior margin straight, continuing the line of the head. Scutellum rather narrow, edges slightly concave near the middle, the surface strongly depressed either side leaving a triangular tumid base and carinate line which becomes evanescent toward the depressed tip. Connexivum ochraceous with coarse black punctures segregated on the middle of each segment. Pleural pieces coarsely punctated, marked with a smooth area on the middle of the pro- and meso-pleuræ; osteolar canal black on the expanded apex. Venter more finely and obscurely punctured, marked on each segment with marginal groups of black punctures, a double median group more or less distinct and sometimes an intermediate group. Apex of the genital segment of the male more deeply sinuated than in *alternatus*. Length 10 to 12 mm.

Described from two male and three female examples taken from the following localities: Salt Lake City, Utah, one example taken May 30th by Mr. G. Wesley Browning and one received from Prof. Herbert Osborn; Moscow and Lewistown, Idaho, two examples taken by Prof. J. M. Aldrich; and Reno, Nevada, one example taken by Prof. H. F. Wickham, July 18, 1903. This very distinct form may be distinguished from our only other known North Ameri-

can species, *E. alternatus* Say, by its large size, depressed form, flat triangular head and thorax, and the carinate scutellum.

Genus **ODONTOSCELIS** Lap.

This genus may be distinguished from *Camirus* by the absence of an external osteolar orifice and by the short transverse pronotum, the surface of which, while flattened, has no transverse furrow but a distinct longitudinal depression parallel to the lateral margin. The margins in the typical forms are feebly arcuated and expanded so as to form a more or less distinct ledge beneath on the sides of the propleura. In the European *dorsalis* and *fuliginosa* the head is shorter than broad, and rounded before, and the pronotal margins are incised before the humeral angles. In the two species described below, the head is longer and the humeri are entire, but with the limited material at my command I do not like to establish a new genus on these characters alone.

In the Bulletin of the U. S. Geol. and Geog. Survey of the Territories, vol. ii, pl. xix, fig. 4, Dr. Uhler figures an *Odontoscelis catulus* Uhler, and includes the same name in his Check List, with the habitat "W. Ind." I cannot, however, find that he ever published a description of this form, and Lethierry and Severin omit it from their Catalogue Generales des Hemipteres. The following key may assist in discriminating the species described below:

Buculæ triangularly elevated posteriorly; head shorter, broad at tip, dark brown; sides of the pronotum feebly arcuated; scutellum with vermiculate brown markings ..... **Balli.**

Buculæ rounded, head longer, obtusely triangular at tip, black; sides of the pronotum feebly sinuated; scutellum with an incomplete black annulus at apex, and in the female with a black subbasal patch and indistinct oblique rays ..... **producta.**

Odontoscelis Balli n. sp.

Closely allied to *dorsalis* of Europe but a little smaller and more elongated in form. Fulvous brown, closely punctured and covered with a short cinerous pubescence, which becomes longer on the head, sides of the pronotum, and abdominal margins; scutellum with vermiculate brown marks. Head a little longer and more convex above than in *dorsalis* sides before the eyes almost parallel, the apex broadly rounded; cheeks broad at apex, tumid, the sutures either side of the tylus deeply impressed, color dark brown, closely covered with a long brown pubescence mixed with cinerous along the sutures. Buculæ elevated posteriorly in a broad triangle. Antennæ rufous-brown, in structure characteristic of the genus; second and third joints subequal, fourth longer, fifth longest and with the preceding slightly flattened. Rostrum reaching the posterior coxæ, apical

two joints thickened, black. Pronotum transverse, anterior and posterior margins straight and parallel, sides depressed with margins rather broadly flattened, the edge narrowly recurved and slightly arcuated, fringed with stiff hairs; anterior angles rounded, humeri obtuse, not incised as in the European species; color fulvous brown, the broad submargins and a few irregular transverse lines on the disk posteriorly, and the callousities, blackish. Scutellum longer than in *dorsalis*, sides parallel, apex regularly rounded; color fulvous brown, with darker vermiculate markings, which in the male become finer and transverse along the middle where they are interrupted, forming an irregular blackish patch on either side of the disk, and outlining an indistinct triangular apical spot; base with a short longitudinal black line on either side. Pronotum and scutellum with a common obsolete pale longitudinal median line. Connexivum alternated with dark brown and pale fulvous. Beneath black; coxal region, an ill-defined spot on the hind edge of the mesopleura, legs and venter, obscure rufous, the latter becoming darker toward the margins. Sides of the propleura strongly depressed, the edge of the pronotum forming a broad shelf beneath. In the female the vermiculate lines on the scutellum are more irregular and coalesce to form a blackish patch on the disk either side of the middle; the colors below are more strongly contrasted, and the femora and inner surface of the tibiæ are black. Length 5 to 6 mm.

Described from one pair taken at Fort Collins, Colo., May 20, 1899, and a female from Independence, Cal., taken July 17th by Prof. H. F. Wickham. Prof. Wickham has also sent me a nymph taken July 27th at Hawthorne, Nev., and more recently Prof. Gillette has sent me a long series taken at Fort Collins during May and June, and Mr. Henshaw one from Wyoming. The Fort Collins types were sent to me by Prof. Elmer D. Ball, an enthusiastic collector and an able student of the Homoptera, to whom I take much pleasure in dedicating this first described American species of *Odontoscelis*.

This species and that described below are best located in the genus where I have placed them, although the head in these American species is longer and the humeri want the incision found in the European species; the general form is also proportionately longer, but all other characters are those of *Odontoscelis*. As this genus has not before been recognized from our fauna, I have included in the description given above a number of purely generic characters.

Odontoscelis producta n. sp.

Closely allied to the preceding but still more elongated. Head long, shaped as in *Camirus conicus* Germ., above strongly convex, sides subparallel for some distance before the eyes, then obliquely truncated to the broad rounded apex of the tylus; color black, obscured by a dense coating of matted cinerous hairs above and below; buculæ rounded. Pronotum proportionately longer than in *Balli*, the margins not so broadly expanded, feebly sinuated anteriorly. Upper surface of the whole insect closely and finely punctured with brownish, and covered with

a short grey pubescence; color soiled yellowish or tawny, paler than in *Balli*, marked above with a longitudinal pale median line, which becomes almost obsolete on the pronotum. Narrow lateral and posterior margin of the pronotum and the region of the callousities sometimes blackish. Impressed submargins and a few obsolete markings on the disk of the pronotum brown. Scutellum in the female with an oval subbasal black spot, and on each side of this an indefinite longitudinal vitta that is deflected to the lateral margins behind the middle and the apical region brownish, bordered incompletely with black. In this dusky apical field is a pale spot defined anteriorly by a black semicircle, and there are groups of dusky punctures near the basal angles and on either side of the pale median line behind the black subbasal spot. In the male all these dark markings become nearly obsolete but the pale median line and the black apical semicircle persist. Beneath black with the antennæ, base of the rostrum, coxæ and venter pale. Legs piceous, with the knees, exterior surface of tibiæ, and base of the tarsi pale. Connexivum alternated with brown. In the female the ventral sutures and a line on the stigmata are blackish. In both sexes the whole lower surface is densely white pubescent. Length 5 mm.

Described from a pair taken at Holly, Colo., September 8, 1898, and sent to me by Prof. Ball with the preceding species, and three females taken at Fort Collins, Colo., in June, and kindly sent to me by Prof. C. P. Gillette. This species might be placed in *Camirus* were it not for the absence of an osteolar orifice and the form of the pronotum. The hairy vestiture of the whole surface is also characteristic of *Odontoscelis*.

Subfamily Graphosomidæ.

This subfamily is represented in our fauna by but two genera. These are black and rough-looking little insects, with the scutellum large, covering nearly the whole upper surface of the abdomen and furnished with a very short frenum. They have the humeral angles of the pronotum emarginate, with a tooth before the sinus; the anterior angles of the pronotum are armed with a tooth or lobe, and the head is long with the sides sinuated, the eye prominent and stylated, and the cheeks broad at apex, equalling or exceeding the tylus. They may be distinguished as follows:

Cheeks thin, flattened, a little longer than the tylus; antenniferous tubercules prominent beyond the sides of the head, armed without with a curved spine; angles of the pronotum armed with a short acute tooth. Genus **Podops.**

Cheeks convex, tumid, considerably longer than, and contiguous before, the tylus; antenniferous tubercles scarcely prominent beyond the sides of the head, unarmed; anterior angles of the pronotum armed with a prominent rounded and denticulate lobe ..... Genus **Oncozygia.**

Genus **PODOPS** Lap.

Our two species belong to the subgenus *Amaurochrous* Stal, included in his synopsis of the genera of American Pentatomidæ under the name *Scotinophara* Stal.

Size larger (6½ mm.); humeral tooth large, obtuse, its anterior edge arcuate; disk of the venter posteriorly more nearly smooth; outer apical angles of the male genital segment projecting beyond the general contour line, visible from above; apex of the female genital segment with a median sinus ..... **cinctipes.**

Size smaller (5 mm.); humeral tooth short, acute, anterior margins rectilinear, continuous with the latero-anterior margin of the pronotum; disk of the venter strongly punctured to the apex; outer apical angles of the male genital segment obtuse, scarcely prominent; apex of the female genital segmens truncated ..... **parvulus.**

Podops cinctipes Say.

I have placed under this name the larger species found throughout the northern States and Canada. Dr. Uhler records its occurrence in several of the southern States, so it probably extends its range over pretty nearly the whole of the United States and Canada. So far as I can see, the figure and description of *dubius* in the large work of Palisot de Beauvois answers in almost every particular for the present species, but Stal, in the Enumeratio, places it as distinct, giving Cuba and San Domingo as the habitat for *dubius*, and states that the lateral processes of the pronotum are longer than in *cinctipes*. These species are also cited as distinct in Lethierry and Severin's Catalogue, and it is therefore probably safe to assume that there is a West Indian form that is sufficiently distinct from *cinctipes*. The latter species is not uncommon about Buffalo, and I have seen specimens from Montreal and New Jersey. As the species described below has heretofore been confounded with this, I will not attempt to quote other localities.

Podops parvulus n. sp.

Allied to *cinctipes* but smaller with the humeral tooth more acute. Head as in *cinctipes* but with the stylated eyes a little more slender and separated more widely from the angles of the pronotum. Antennæ a little shorter and more slender, second and third joints more strongly differentiated, these and the fourth a little paler than in *cinctipes*. The pronotum differs in having the median transverse furrow more uniform, the anterior furrow farther from the fore border with the surface before it more elevated above the base of the head, the lateral margins more strongly arcuated anteriorly, with the humeral tooth more acute, and produced more backward and downward. The venter is

deeply and uniformly punctured, while in *cinctipes* the disk of the sixth segment is almost smooth, the punctures becoming obsolete toward the median line. The genital characters of these species are quite distinct. In *parvulus* the male has the punctured basal area longer, the apical sinus broader and more shallow, and the outer apical angles rounded and hardly prominent. In *cinctipes* these angles are strongly produced in obtuse but narrow recurved lobes that project distinctly beyond the apex of the scutellum when viewed from above. In the female of *parvulus* the inner plates and median plate nearly or quite attain the line of the outer plates, while in *cinctipes* they are shorter, leaving an obvius median sinus on the apical margin. Length about 5 mm.

Described from a pair taken in Colorado, a male from Montreal, Canada, and a female taken from Wood's Hole, Mass., and Prof. Osborn has sent me a pair taken in Colorado and a male from Douglas County, Kan.

Oncozygia clavicornis Stal.

Mr. Otto Heidemann has very kindly given me a specimen of this interesting species that was taken at Fortress Monroe, Va., October 10, 1891. Stal's type came from Texas.

Subfamily Cydnidæ.

These little brown ground-bugs are quite distinct both in appearance and habits from our other Pentatomidæ. I have at present but a very inadequate representation of this group in my collection, and these are but partially worked up, so for the present I will merely list the species thus far reported from our territory. A very complete monograph was published by Signoret in the volumes of the Annales de la Societe Entomologique de France for the years 1881 to 1884. An earlier paper on our North American forms was published by Dr. Uhler in volume three of the Bulletin of the United States Geological and Geographical Survey of the Territories, which contained a somewhat unsatisfactory synopsis of the genera. This paper is, however, invaluable and contains most that we know of our species.

Cyrtomenus mirabilis Perty.

Recorded from South Carolina, Georgia, Florida and South America by Dr. Uhler; Prof. Snow has taken it in New Mexico; and Mr. Henshaw has sent me an example from Texas.

Cyrtomenus castaneus A. and S.

A southern form extending its range northward to Texas and Arizona.

***Macroporus repitetus** Uhler.

California (Uhler).

Homaloporus congruus Uhler.

Colorado and Texas (Uhler).

***Cydnus (Æthus) communis** Uhler.

Florida and Texas (Uhler).

***Cydnus (Cryptoporus) compactus** Uhler.

Described from Texas.

***Cydnus (Trichocoris) conformis** Uhler.

Described from California.

***Cydnus (Rhitidoporus) indentatus** Uhler.

Recorded from Florida by Dr. Uhler.

Cydnus (Microporus) obliquus Uhler.

Described from California, Utah and Texas. More recently Prof. Wickham has taken it in numbers in New Mexico and California.

***Cydnus (Microporus) testudinatus** Uhler.

California (Uhler).

***Cydnus politus** Sign.

Described from California.

Pangæus bilineatus Say.

Dr. Uhler records this from most of the Eastern and Southern States, from New York and Massachusetts to Texas and Utah, and Prof. Osborn from Iowa and Oregon.

Pangæus discrepans Uhler.

Described from material taken in Indian Territory, California, Texas and Mexico. Prof. Aldrich has taken it at Lewiston, Idaho.

***Pangæus margo** Dallas.

Dr. Uhler records this species from Arizona.

Pangæus piceatus Stal. Arizona (Uhler).

California (Museum of Comp. Zool., Cambridge).

***Pangæus Spahnbergi** Sign.

Described from Texas.

Pangæus Uhleri Sign.

Recorded by Dr. Uhler as *rugifrons* H. S. from South Carolina and Georgia.

Geotomus parvulus Sign.

Described by Dr. Uhler from California as *Melanæthus elongatus*.

Geotomatus pennsylvanicus Sign.

Dr. Uhler described this as *Melanæthus picinus* from Pennsylvania. I took a single example from under stones at Griffin, Georgia, in May, 1899.

Geotomus robustus Uhler.

The types were from Maryland and Massachusetts. Rev. M. Wirtner has kindly given me a specimen from Jeanette, Pa., and it is included in Smith's Catalogue of Insects of New Jersey.

***Geotomus subglaber** Walker.

Described from "North America." It does not seem to have been recognized by recent students.

***Geotomus Uhleri** Sign.

"Am. Boreali" (Signoret).

Geotomus punctatissimus Sign.

Described from Sitka.

Amnestus spinifrons Say.

Generally distributed throughout the United States as far west as Colorado and Texas.

Amnestus pusillus Uhler.

A common species in the eastern United States. I have seen specimens from New York, New Hampshire, Indiana, Mississippi, Kansas and the Island of Trinidad. Dr. Uhler records it from

North Carolina, Tennessee and Lower California, and Prof. Osborn from Iowa. *A. subferrugineus* of Smith's Catalogue of the Insects of New Jersey may belong here.

***Lobonotus anthracinus** Uhler.

Described from Texas.

Sehirus cinctus P. B.

Dr. Uhler gives as the habitat of this species "Almost all of the United States as also Canada and Mexico." About Buffalo it grows to a larger size that farther south and west. I have seen Canadian material from Manitoba (Hanham) and Montreal (Chagnon).

Subfamily PENTATOMIDÆ.

Our best synopsis of the genera in this large subfamily is that published by Stal in Of. Kongl. Vet.-Akad. Forh., xxiv, No. 7, pp. 522-532, 1867. In the Proceedings of the Iowa Acad. of Sciences, Vol. vi, pp. 40–46, 1898, Mr. H. E. Summers has published an adaptation of Stal's synopsis, which contains much original work, and has the advantage of being in the English language and of being more nearly up to date. Mr. Summer's synopsis contains also the American genera of the subfamilies Graphosomidæ, Asopidæ and Acanthosomidæ.

Mecidea longula Stal.

Described from Texan material, but it has since been reported from New Mexico by Uhler, and from Iowa by Prof. Osborn; and Prof. E. D. Ball has kindly sent me an example taken at Holly, Colo., Sept. 8, 1898. Both in form and coloration this singular Pentatomid bears a strong resemblance to the common Capsid, *Miris affinis*, and might readily be mistaken for a large example of that species.

Genus **BROCHYMENA** A. and S.

This genus forms a very distinct group in the North American Pentatomid fauna. Of the twelve recorded species all but two have been found within our territory. I have seen many uncertain forms of *Brochymena* that I cannot locate to my satisfaction. The whole genus sadly needs revision. The following key may assist in locating our species:

Humeral angles produced in a short, dentate and truncated lobe.....1.
Humeral angles prominent but oblique or rounded anteriorly, and minutely serrated or unarmed.....3

1. Anterior tibiæ dilated toward their apex; cheeks scarcely exceeding the tylus (a species not yet found within our limits).....**hadula.**
Anterior tibiæ scarcely dilated.....2.
2. Basal one half of each antennal joint pale.....**Poyei.**
Narrow base only of antennal joints pale.....**arborea.**
3. Lateral margin of the pronotum behind the sinus entire, unarmed; before the the sinus rounded and calloused, smooth or obtusely dentate (Stal).....**myops.**
Surface of the pronotum punctured to the edge along the latero-anterior margins.....4.
4. Cheeks distinctly longer than the tylus and contiguous or nearly so before its apex, or generally leaving a deep narrow sinus; second joint of the antennæ shorter than the third; rostrum reaching on to the second ventral segment.....**quadripustulata.**
Cheeks equalling or slightly exceeding the tylus, in the latter case with their apices rounded and not approaching.....5.
5. Cheeks considerably produced before the apical sinus, their tips obtuse, surpassing the tylus but not contiguous before it; second antennal joint nearly or quite as long as the third.....6.
Head shorter, truncated at apex; cheeks scarcely exceeding the apical sinus, little longer than the tylus but sometimes contiguous over its depressed apex; second antennal joint distinctly shorter than the third.....8.
6. Basal two joints of the antennæ rufous; latero-anterior margins of the pronotum strongly dentate.....**affinis.**
Antennæ fuscous or black with the narrow base of the third and fourth joints pale.....7
7. Size medium; latero-anterior margins of the pronotum with but about three distinct teeth.....**obscura.**
Size large; latero-anterior margins of the pronotum closely set with strong teeth; color cinerous with a few large black punctures, and more numerous smaller uncolored ones.....**cariosa.**
8. Latero-anterior margins of the pronotum armed with irregular teeth; base of the pronotum and the elytra with many smooth white points; head truncated before, the apical sinus almost obsolete; bucculæ armed anteriorly with a small acute tooth.....**Harrisii.**
Latero-anterior margins armed with numerous regular teeth; pronotum and elytra without dots; bucculæ with a large stout tooth anteriorly....9.
9. Head before distinctly triangular, the subapical lobes prominent, obtuse; elytra with a discal white point.....**annulata.**
Head truncated, scarcely longer on the middle; white discal point on elytra obsolete; size large.....**marginella.**

Brochymena arborea Say.

This is a distinct and well-known form that is distributed over nearly the whole of the United States and Canada, but seems to be

most abundant in the regions well covered with forests of deciduous trees. It is subject to some variation in the form of the apex of the head, the armature of the sides of the pronotum, and the sculpturation at the apex of the scutellum. In all the specimens before me the cheeks slightly surpass the tylus, with their apex narrow and obtuse, their subapical tooth large, usually obtuse, and almost attaining the tip of the head; the apex of the scutellum is rather blunt and more or less distinctly impressed on the middle. The antennæ are fuscous with the extreme base of the second, third and fourth joints pale. The mesosternum is marked with a transverse black spot.

Brochymena Poeyi Guer.

Mr. Otto Heideman has kindly given me a male from Florida that was determined by Dr. Uhler as *Poeyi*. It differs from Stal's descriptive notes on this species by having the bases only of the antennal joints pale, the tylus attaining the extreme apex of the head, and the mesosternum marked with the large black spot found in *arborea*. It is much paler in color than *arborea*, the obtuse apex of the cheeks does not exceed the tylus and the subapical tooth is reduced to an obtuse angle at the base of the apical sinus. The tip of the scutellum is also more produced and narrowed to an obtuse angle. As this evidently belongs to a species sufficiently distinct from *arborea*, I prefer for the present to leave it as determined by Dr. Uhler, even though it does not fully accord with the known characters of this species.

Brochymena hædula Stal.—This is a Mexican species not yet recorded from our territory. I have included it in the synoptical table above to make that more complete. *B. aculeata* Dist. is another closely allied form from Mexico that may be distinguished from *hædula* by the stronger armature of the pronotum and the uniformly fuscous antennæ.

Brochymena quadripustulata Fabr.

This is by far our most abundant species of *Brochymena* throughout the eastern United States and Canada. It ranges west to Arizona, Utah and California. I have seen this species in several collections under the name *annulata*. Stal gives a very clear and concise characterization of these two species in his Enumeratio that should preclude any possibility of error in their discrimination. The

long head, narrow and cleft at apex, the rounded anterior margin of the humeri, and the pale irregular teeth on the sides of the pronotum anteriorly will distinguish this species. It has been described as *B. 4 punctata* by Provancher and later placed by him under *B. annulata* Fabr. Dr. Uhler in his check list entered Provancher's name as *4 notata*.

***Brochymena myops** Stal and **laticornis** Say.

These are the only species from our territory that I have not yet seen. Judging from Stal's synoptical notes *myops* should be distinguishable from *quadripustulata* by the pale calloused latero-anterior margins of the pronotum which are unarmed or nearly so. Could not Say's *Pentatoma laticornis* be the same?

Brochymena obscura H. Sch.

As represented in my collection this species is a little smaller and proportionately broader than *quadripustulata*, the cheeks are shorter, scarcely exceeding the tylus and marked above with longitudinal smooth pale rugæ; the surface of the pronotum is more evenly and closely punctured, and the sides anteriorly are armed with about three stout acute teeth; the scutellum is shorter, with the apex less produced and the surface closely and deeply punctured as is the pronotum; the second joint of the antennæ is almost equal to the third, and the rostrum is longer, reaching to the middle of the third ventral segment in the female. On the upper surface there is a smooth median line, somewhat interrupted, from the tip of the tylus to the apex of the scutellum. This species seems to be peculiar to the Southwestern States, occurring from Colorado to California and southward to Mexico.

Brochymena affinis n. sp.

Very closely allied to 4-*pustulata* Fabr.; differing principally from that species in having the genital segment of the male very short and broad, extending on either side beyond the sixth ventral segment and beyond the projecting apex of the membrane, and heavily fringed with long pale hairs either side of the median sinus. Two basal joints of the antennæ rufous, the remaing joints black with rufous incisures, second joint nearly or quite as long as the third, fifth a little shorter than the preceding. Head about as in 4-*pustulata* but with the tylus scarcely shorter than the cheeks. Sides of the pronotum distinctly rounded and strongly toothed before the sinus. Scutellum perhaps a little broader and more rounded at tip than in 4-*pustulata*. Rostrum reaching to the middle of the third ventral segment, pale with a black tip and median line within. Other characters

substantially as in *4-pustulata*. The general color, however, seems to average somewhat lighter. Length 13–16 mm., width across the humeri 7–8 mm.

Described from two male and six female examples taken at Palo Alto, California, in January, 1892, labelled "L. S. Jr. U. (Leland Stanford Jr. Univ.), No. 19," and received from Cornell Univ; one male taken at Moscow, Idaho, by Prof. Aldrich, and one male taken at Olympia, Wash., by Mr. T. Kincaid, also received from Cornell University.

It may seem rash to describe a new species in this difficult genus on such slight characters, and I would not think of doing so were it not that the form of the genital segment of the male is entirely distinct from that of any described species known to me. The rufous two basal joints of the antennæ, with the second as long as the third also seems to be characteristic. The head is elongated as in *4 pustulata* and *obscura*, but the apex is formed about as in *cariosa* Stal, being intermediate between the *4-pustulata* group and the *annulata* group.

Brochymena cariosa Stal.

This is our most showy and, excepting *marginella*, our largest species of *Brochymena*. The black punctures and markings on the pale yellowish ground gives it a very lively and pretty appearance. The form of the head is about as in *obscura* and *affinis*. Aside from its large size and strongly contrasted markings it may be distinguished from *obscura* by the numerous large teeth on the sides of the pronotum, and from *affinis* by the form of the genitalia. In the only specimen now in my collection the basal two joints of the antennæ are paler than the others, but not rufous as in *affinis*. This species is known from Texas, Arkansas, Louisiana, Mississippi and Florida.

Brochymena annulata Fabr.

This species is very distinct from *4 pustulata*, representing a different section of the genus, distinguished by the more broadly ovate form. The short and broad head is truncated at apex, with the apical sinus nearly transverse; the surface is finely and closely punctured and ornamented in places with groups of larger black punctures; the sides of the pronotum before the sinus are strongly arcuated and armed with close regular teeth; the second joint of the antennæ is much shorter than the third, and the rostrum is long,

usually attaining the third ventral segment. In *annulata* the cheeks are more produced than in the two allied species (*marginella* and *Harrisii*), and converge at apex over the tip of the tylus which they very slightly exceed. There is a small pale point on the disk of each elytron posteriorly and the connexivum is quite strongly banded.

This seems to be a comparatively rare species which I have seen from the eastern United States only. It is more abundant toward the south, my material showing a range from southern New York to Florida. *Halys carolinensis* Westw. is certainly a synonym of *annulata* and not of *4 pustulata* as given in the Lethierry and Severin Catalogue.

Brochymena marginella Stal.

Through Mr. George Frank, of Brooklyn, I have received a fine example of this large species. It is considerably larger even than *cariosa*, this individual, which was captured in Harris County, Texas, in March, 1901, measuring 20 mm. in length. The pale margin of the connexivum is nearly continuous though not at all conspicuous; and there is an almost obsolete pale band in the middle of each segment; the apex of the head is a little shorter and blunter than in *annulata*, and the tips of the cheeks do not meet over the apex of the tylus. The Lethierry and Severin Catalogue erroneously gives "Carolina" as the habitat of this species. It should read "Texas." Prof. Osborn has recently sent for my examination an example taken in Florida.

Brochymena Harrisii Uhler.

This name is placed as a synonym of *annulata* by Lethierry and Severin and is doubtfully referred to the same species by Stal in the Enumeratio. The present species, however, agrees better with Dr. Uhler's description than does *annulata*, and I believe it is the one described by him. This description was comparative with *annulata*, but his *annulata* was evidently the *4 pustulata* as recognized above. It may be distinguished by the short head, almost square across the apex, the coarser teeth on the sides of the pronotum, and the paler smooth raised points on the pronotum, scutellum and elytra. The scutellum is shorter than in *annulata*, and at each basal angle is marked with an oval group of deep black punctures. The female

genitalia are also quite distinct, the valves being more convex and the outer plates more produced inwardly on the apical margin. The rostrum is a little shorter in my specimen and the second joint of the antennæ is longer, the tooth at the anterior end of the bucculæ is much smaller than in either of the allied species. My only specimen is a female kindly sent to me by Mr. W. M. Scott, formerly State Entomologist of Georgia, in which State it was captured. I have seen another from the same State in the Cornell University collection.

Genus **SCIOCORIS** Fallen.

This is distinctively a palæarctic genus of which no species has heretofore been recorded in this country. Butler has described one from South America, and Walker another from St. Vincent, but the latter may not be correctly located here. Recently Prof. Osborn has sent me for study a single specimen that he thinks was taken in southern Texas, and from Mrs. Slosson I have received a specimen of *microphthalmus* captured by her in the White Mountains. Prof. Osborn's species I have not been able to identify with any yet described; I do not, however, like to publish it as new without more material.

Sciocoris microphthalmus Flor.

Mrs. Annie Trumbull Slosson has very kindly sent for my examination a specimen of this species taken by her on Mt. Washington, New Hampshire. It is the first and only occurrence of this species in our territory of which I have knowledge. This is a little brown depressed bug with alternated connexivum and broad rounded head and scutellum.

Genus **PERIBALUS** M. and R.

Scutellum broad and concolorous to the apex, without a white tip; connexivum alternated ..... **tristis.**

Scutellum with a white tip ..... 1.

1. Connexivum alternated; scutellum moderately broad ..... **abbreviatus.**
   Connexivum black with a pale margin ..... 2.
2. Scutellum broad; body strongly convex, broadest behind the middle. **piceus.**
   Scutellum narrow at tip; form more depressed and narrowed posteriorly. **limbolarius.**

Peribalus limbolarius Stal.

A very abundant species found throughout the United States and Canada. I possess specimens from New York, New Jersey, Georgia,

Kansas, Colorado, Utah, California and Vancouver Island, and have seen others from Montana and Manitoba. It has also been recorded from Arizona, Texas and Mexico. The specimens from the east are mostly large and dark colored, while those from the arid regions are small and pale. In some of the dark specimens the pale margins of the connexivum are scolloped within, thus showing an approach to those having the connexivum alternated. A good figure of a moderately dark specimen is given at Plate VI, fig. 19 of the Biologia.

Peribalus abreviatus Uhler.

This species, described as a *Holcostethus*, has been omitted from the Lethierry & Severin Catalogue. It seems to be characteristic of the Rocky Mountain region. I have found it quite common in July on the mesquite bushes growing on the dry mountain sides in Colorado. Prof. Wickham has sent me a specimen taken at Kalispell, Montana, in June, and Dr. Uhler records it from Kansas, Utah, California, British America and Lower California.

Peribalus tristis n. sp.

Form depressed, oval, scarcely narrowed posteriorly, sides of the pronotum strongly arcuated, apex of the scutellum broad, scarcely touched with white at tip, connexivum alternated with black and fulvous, beneath black with fulvous spots on the margin of the venter. Fusco-luteous, very thickly and strongly punctured with black giving the whole insect a bronzy-black appearance, especially on the head, sides of the pronotum, base of the scutellum, and sides of the venter. Apex of the head distinctly emarginate, the median line above obscurely pale. Pronotum broad, depressed, humeral angles rounded, edge fulvous, callousities black, marked with a pale point as in *piceus*. Scutellum broader at apex than in either *limbolarius* or *abbreviatus*, proportionately a little longer and more contracted posteriorly than in *piceus*, extreme tip paler but not white and calloused as in our other species. Elytra paler and more mottled than the rest of the upper surface. Beneath with more obvious coppery reflections, punctures larger on the pleural pieces, becoming confluent toward the anterior and lateral margins. Disk of the venter somewhat paler, the extreme edge with a pale spot on the middle of each segment. Legs pale, the femora with black punctures which may become confluent toward their apex. Antennæ testaceous or rufous, becoming black toward the apex, incisures pale. Rostrum reaching between the posterior coxæ, pale with the median line and tip black. Length 8 mm., humeral width 4½ mm.

Vancouver Island, British Columbia. Described from two female examples received from Rev. Geo. W. Taylor, and labelled August 20, 1897, and May 24, 1898.

This species may be distinguished by the broad, almost concolorous apex of the scutellum and the depressed pronotum, with the sides strongly arcuated, together with the maculated connexivum and blackish submetallic venter. It is doubtless subject to variation in the extent of obscuration by black punctures.

Peribalus piceus Dallas.

Like the preceding, this insect has a northern habitat. My only specimen was taken at Bozeman, Mont. in July, and kindly presented to me by Prof. R. A. Cooley. Mr. W. H. Harrington has taken it near Ottawa, Ont.; Prof. Osborn records the capture of a pair in Iowa, and the type was from Hudson's Bay. *Peribalus piceus* differs from our other species in being broadest behind the middle of the abdomen and more convex both above and below. It is a dark-colored form, with the pale margins of the abdomen and the apex of the scutellum strongly contrasted. There is a pair of round white dots on the disk of the pronotum anteriorly, and the pale margin of the connexivum is undulated within; the legs are piceous, becoming pale brown on the outer surface of the tibiæ and base of the tarsi; antennæ brown, shading to piceous on the apical joints and with the incisures pale; rostrum brown, reaching the posterior coxæ.

Dr. W. L. Distant writes me that *Pentatoma dubia* of Dallas (List, p. 237) is a *Peribalus*. It was described from North American material, but I cannot make the short diagnosis agree with any of the species enumerated above. It might well be a form of *limbolarius* were it not for the use the author makes of the word "pilosis." The only other North American species to which this would apply is *Trichopepla semivittata* Say.

Genus **TRICHOPEPLA** Stal.

Antennæ rufous with the apical two joints black; head narrow at apex; sides of the pronotum more oblique ..... **semivittata.**

Antennæ black, basal joint only rufous; head broader at apex; sides of the pronotum less oblique ..... **atricornis.**

Trichopepla semivittata Say.

Widely distributed and locally abundant. My collection contains material from New York, New Jersey, Delaware, Washington, D. C., Indiana and Colorado, and Mr. Chagnon has taken it at Montreal. I once found this insect in large numbers on carrot blossoms in a

waste field near Buffalo as late as November 3d. They were in all stages of development, and I was surprised to find that the imagoes were blackish at first with the connexivum margined with pale. After they attained full maturity they assumed their ordinary pale color, with the connexivum maculated.

Trichopepla atricornis Stal.

As stated by Dr. Uhler, this species belongs more to the north and west of North America. My specimens are from Montana (Cooley) and Idaho (Aldrich). Uhler records it from Illinois, Wisconsin, Colorado, California, British America and Alaska. It differs from the preceding species in having black antennæ, a broader head, and a proportionately longer pronotum, with the lateral margins distinctly less oblique. This species exhibits the same variability in the markings on the connexivum found in *semivittata*, but here the pale border seems to persist, in some of the fully matured adults, which I have never found to be the case in *semivittata*.

Genus **PENTATOMA** Oliv.

Lateral margins of the pronotum carinated but not distinctly reflexed. (*Lioderma* Uhler.) ..... 1.

Lateral margins of the pronotum acutely carinated and narrowly sharply reflexed ..... 2.

1. Second and third joints of the antennæ subequal; length to the tip of the membrane about 10 mm.; color olive green or brown; costal margin broadly pale, bordered within with a black line..... **saucia.**

   Second joint of the antennæ longer than the third; length about 8½ mm.; form oval, triangularly produced before; color green or olive green, margins, including those of the head, and the apex of the scutellum pale. **viridicata.**

2. Second and third joints of the rostrum equal or subequal, fourth shorter than the third; form more elongated and produced before. (*Rhytidolomia* Stal.) ..... 3.

   Second joint of the rostrum longer than the third, the latter subequal to the fourth; form proportionately broader and less produced before. (*Chlorochroa* Stal.) ..... 6.

3. Color pale straw-yellow, elytra deep piceous or black ..... **Osborni.**

   Color green or olive ..... 4.

4. Color uniform dark olive brown or somewhat greenish; margins of the pronotum and elytra paler; form more elongated..... **senilis.**

   Color green or olive brown, entire margins behind the head and a median line on the scutellum, sometimes almost obsolete, pale; form proportionately broader, more oval ..... 5.

5. Smaller, 11 mm. in length. Antennæ black, first, second, and base of the third joint green; apex of the genital segment of the male deeply concavely excavated, outer angles subacute ..... **faceta.**

Larger, 15 mm. in length; antennæ black, basal joint only green; costal edge of the elytra beyond the middle blackish; apex of the genital segment of the male feebly concave with a rounded median tooth, outer angles obtuse ..... **Belfragei.**

6. Form elongate oblong; outer margins, apex of the scutellum, three large dots on its base, and numerous smooth calloused points on the pronotum, scutellum and elytra whitish, the margins sometimes tinged with red ..... **Sayi.**

Form broader, the three smooth dots on the base of the scutellum when present inconspicuous ..... 7.

7. Form broad oval; color deep clear green; entire margins behind the head and tip of the scutellum reddish yellow or even crimson; genital segment of the male strongly produced on the ventral surface; inhabits eastern and northeastern States ..... **juniperina.**

Margins of the entire body and tip of the scutellum usually inconspicuously pale, if strongly contrasted or red then the genital segment of the male is not produced on the ventral surface; inhabits the western States.. 8.

8. Size large, form oblong; outer margins and apex of scutellum conspicuously pale or even crimson; pronotum, scutellum and elytra distinctly marked with smooth pale dots; ventral punctures dark..... **ligata.**

Pale outer margins inconspicuous, or the form more ovate with the punctures on the venter concolorous..... 9.

9. Size smaller (9-12 mm.); pale outer margins and apex of the scutellum inconspicuous; genital segment of the male produced on the ventral surface; form ovate ..... **congrua.**

Larger (12-15 mm.); pale outer margins and elytral granules moderately conspicuous, the latter sometimes a little paler than the surrounding surface ..... **Uhleri.**

Pentatoma (Lioderma) saucia Say.

So far as I can learn, the range of this species is confined to the country adjacent to the Atlantic seacoast. I took a few examples on the salt marshes about New Haven, Conn., in 1882; Prof. Ball has sent me several taken at Revere, Mass., in September, and in Smith's List of the Insects of New Jersey it is recorded as having been taken on Staten Island by Mr. W. T. Davis. Say records it from Virginia and Florida, and doubtfully from Pennsylvania or Indiana. The olive brown color, with a longitudinal black line within the costa, will readily distinguish this species.

Pentatoma (Lioderma) viridicata Walker.

This very distinct little species is generally accredited to Uhler, but it was really described by Walker (List ii, p. 28) eight years

before Uhler's description appeared. Walker doubtless received his material from Dr. Uhler with this MS. name attached, which he afterward used when he published his description. I believe this is a rare or at least a local species. Dr. Uhler records it from Montana, Colorada, and Lower California, and the collection of the Agricultural College at Fort Collins, Colo., contains a good series from that State. The color varies, probably with maturity, from light green to dark olive green. The peculiar shape of the insect is well shown in Dr. Uhler's figure.

Pentatoma (Rhytidolomia) senilis Say. (*Ovalis* Westw., Hope Cat., i, p. 39, 1837.)

This species seems to be not uncommon along the Atlantic coast of Long Island, Staten Island, and New Jersey. I cannot learn that it occurs elsewhere, although its range doubtless extends southward at least to Virginia. The long narrow form and uniform dull olive color will distinguish this species It closely resembles the figure of *Elia atricornis* Westw. given by Distant in Proc. Zool. Soc., 1890, pl. 53, fig. 8, but is much larger than the size indicated on the plate.

***Pentatoma (Rhytidolomia) Belfragei** Stal

I am indebted to Prof. Herbert Osborn for the opportunity of examining a fine specimen of this interesting species taken at Little Rock, Iowa. The color is a light greenish testaceous, with the elytra and venter of a clearer green, the narrow edge of the pronotum and elytra and a broad median vitta on the scutellum are yellowish. There is a slender curved black line on the sides of the propleura anteriorly, and the costal edge of the elytra beyond the middle and the sides of the scutellum at apex are blackish. The sides of the head are less deeply sinuated than in *faceta*, and the tibiæ are much more deeply sulcate above.

This is certainly a rare species, and is probably confined to the Mississippi Valley and the adjacent fertile plains. Stal records it from Illinois, and Uhler adds Canada and Nebraska.

Pentatoma (Rhytidolomia) Osborni n. sp.

Form of *P. faceta* Say, but much larger. Pale testaceous yellow, coarsely and deeply punctured, elytra piceous black, the costa broadly pale. Head long and tapering as in *faceta*, cheeks hardly longer than the tylus, not so long as in *senilis* punctures confluent on the cheeks, more distant on the base of the vertex, almost

obsolete on the tylus. Antennæ long, pale greenish, becoming infuscated toward the apex; first joint very short, reaching about half way to the tip of the head, second longer than the third, fourth and fifth subequal, a little thicker than the preceding. Rostrum reaching almost to the base of the third ventral segment, pale, with a median line beyond the middle, and the apical joint, black. Pronotum strongly narrowed anteriorly, the sides straight or very feebly arcuated, sharply carinated, punctures closer and finer anteriorly, becoming larger posteriorly. Scutellum more sparingly punctured toward the tip which is a little broader than in *faceta*. Elytra piceous black, darker in the male, the costal area testaceous yellow, the punctures finer than on the pronotum and becoming confluent near the base. Membrane fuscous, nervures strong. Connexivum testaceous yellow. Beneath testaceous, pleural pieces strongly punctured. Venter obsoletely aciculate-punctate. Legs pale greenish-yellow becoming infuscated on the tarsi. Length 13 mm. Width across the humeri 7¼ mm.

Colorado and Texas. Described from a male taken at Rockyford, Colo., July 16, 1901, by Prof. E. D. Ball, another male taken at North Braunfels, Texas, June 16th, by Prof. Wickham, and two females labeled "Alpine, Texas, July 26th." One of these was kindly given to me by my friend, Prof. Herbert Osborn, in whose collection two of the types now are, and to whom I take pleasure in dedicating this very distinct and interesting species as a slight token of my appreciation of his faithful and invaluable labors on the North American Hemiptera, and of his generous assistance to me in my studies.

The uniform pale yellowish color of this species, with the strongly contrasted black elytra, will at once distinguish it.

Pentatoma (Rhytidolomia) faceta Say.

Say described this species from "Missouri," which, of course, included much more than the Missouri of to day; Uhler records it from Dakota and California. Prof. Ball has sent me a good series from Colorado, and I have received it from Salt Lake City (Browning), and Keeler, Cal. (Wickham). In July, 1900, I took numbers of both young and adults on a grassy meadow close to the river bank at Grand Junction, Colo. In but one or two specimens does the longitudinal pale line on the pronotum become at all conspicuous. Sometimes there is a black line on the margin of the scutellum either side of the apex.

This is the last of our species having an elongated form with the head and pronotum more triangularly produced and the third joint of the rostrum much longer than the fourth. The species following belong to the subgenus *Chlorochroa* Stal. While it is possible quite

readily to separate the species of the latter subgenus by their form and general appearance, it is sometimes very difficult to indicate in words any salient points for distinguishing them. The characters given in the key are the best I have yet been able to detect. When living on the whitish vegetation characteristic of the parched prairies of the arid regions, the colors become correspondingly pale. Under other conditions, at least in *Sayi* and *ligata*, they become deep blackish green with the markings strongly contrasted.

Pentatoma (Chlorochroa) juniperina Linn.

When fully colored, this is a beautiful insect, with its bright crimson border about the clear green body. It is abundant in the eastern States north of New Jersey and in eastern Canada. How far west in Canada it extends I have not yet been able to determine.

Pentatoma (Chlorochroa) Uhleri Stal.

This is perhaps the most abundant *Pentatoma* found in Colorado and the adjacent portions of the Rocky Mountain region. A long series received from the Agricultural College at Fort Collins shows a very marked variation toward *juniperina* on the one hand and *ligata* on the other. Either this is still a plastic group or species that has not become well fixed or my material contains two or more species I have not been able to delimit. The form I have considered typical *Uhleri* is most nearly allied to *juniperina*, but has a more broadly ovate form, and the genital segment of the male is much shorter on its ventral aspect; viewed from the side, this portion projects but little beyond the dorsal portion. In this, as in all the allied species, the retracted dorsal edge of this segment is feebly sinuated with a minute median notch, and on the base below are two distant, oblique, oval, blackish spots that are ordinarily quite inconspicuous.

In Horæ Soc. Ent. Rossiæ, vol. 4, p. 99, 1867, Kouchakevitch describes a *Cimex flavomarginatus* that I believe is the same as *Uhleri*. If this proves to be the case, the latter name will have to give way to *flavomarginatus*. For the benefit of those who have not access to the paper by Kouchakevitch, I copy here his Latin diagnosis, and append a free translation of his Russian notes that was kindly made for me by Dr. Schröter of this city. I leave the final determination of the synonomy of this difficult species until a more careful revision of the genus can be made.

"*Cimex flavomarginatus* A. Kouch. Male, female, long. 12 mm., lat. 6½ mm., tab 2, fig. 3. Oblongo-ovatus, viridis, punctatus, thorace hemielytris margine antico abdomineque lateralibus anguste flavis, lævibus, nitidis; scutellum, maculis tribus in ipsa basi et quarta majore, triangulari pallide flavis nitidis. Antennis pilosis apice obscurioribus, rostro articulo ultimo nigro; pedibus viridibus, tibiis flavicentibus pilosis; unguiculis nigris."

"Similar to *juniperina*, more convex and narrower. Color lighter and clearer green; three pale points on the base of the scutellum, two of these on the basal angles more distinct, and a large triangular one on the apex; from this a feeble furrow runs forward, on each side of which are a few paler raised points. Rostrum reaching the base of the abdomen, last joint piceous. Antennæ, first joint green, second olive green, remaining joints rufescent."

This species might be identified with *juniperina* were it not that the author compares his insect directly with that species and considers it as distinct. His figure indicates a broader species, with the three pale calloused points on the base of the scutellum more pronounced and the outer margins paler in color than in *juniperina*. In both of these species the antennæ are green becoming rufous or rufopiceous toward the tip.

On page 98 Kouchakevitch describes another species from Monterey, of which the following is a copy of the Latin diagnosis:

"*Cimex albosparsus* A. Kouch. Male long. 13 mm., lat. 7½ mm., tab. 2, fig. 2. Pallide viridis, opacus, punctatus; thorace, scutello, et corio elytrorum callositatibus albis, lævibus, irregulariter conspersis; membrana hyalina, connexivo flavoviridis; subtus pallidus, abdomine medio flaviscente viridibus."

I have not yet been able to identify this with any Mexican Pentatomid known to me. Some points in the description indicate *Sayi*, but the form absolutely forbids such a reference. Well executed figures of this species and *flavomarginatus* are given in the paper from which these descriptions are copied, and for the loan of which I am indebted to the kindness of Dr. Henry Skinner of the Philadelphia Academy of Natural Sciences.

Pentatoma (Chlorochroa) congrua Uhler.

This species is somewhat of a puzzle to me. Uhler's description agrees very well with some of the smaller specimens of *P. Uhleri*. I have, however, followed the lead of others and identified it with a small species that has come to me from various correspondents under the names *congrua* Uhler, *intricata* Uhler, and *Harrisii* Westw.

My material in this species represents the following localities: Colorado (Ball), Ogden, Utah, and Salt Lake City, Utah (Browning), Moscow, Idaho (Aldrich), and Gallatin County, Mont. (Cooley). Prof. Osborn has kindly sent me a Colorado specimen determined as *congrua* that agrees very closely with mine.

Pentatoma (Chlorochroa) ligata Say. (*Cimex rufomarginatus* Kouch.

This species averages larger than any of the preceding. The elytra and sometimes the scutellum and pronotum are well sprinkled with smooth, pale points; the antennæ are entirely black or with the basal joint only green, and the venter is strongly punctured with dusky or black. This species often becomes of a blackish green color, with the pale markings strongly contrasted. This is in fact the only color I have seen in Mexican material. *P. ligata* ranges from Mexico northward through the Rocky Mountains to Vancouver Island and apparently still farther north to Alaska. The Latin diagnosis of Kouchakevitch, a copy of which I give here, agrees in every particular with our *ligata*, and I am sure there can be no doubt of its identity. Some of the characteristic points mentioned in this description are the black antennæ with a pale basal joint; the pale calloused points on the scutellum and elytra, and the olivaceous venter with piceous punctures and black stigmata. The color, shape and markings agree exactly. Stal evidently did not know of Kouchakevitch's paper, although it was published five years before Part II of the Enumeratio.

"*Cimex rubromarginatus* A. Kouch. Male, long. 12½ mm., lat. 6¾ mm. tab. 2, fig. 4. Elongatus-ovatus; supra piceus-olivaceus, punctatus, oculis olivaceis. Thorace lateralibus, scutello apice, elytrorumque marginibus anticis, connexivo, supra et subtus rubrotestaceis. Scutello et corio elytrorum punctis callosis albis, sparse notatis. Membrana fusca, nitida. Subtus olivaceus, pallide piceo-punctatus lateribus abdominis fuscentibus stigmatus nigris. Pedibus olivaceis, tarsis fuscis. Rostro olivaceo, articulis apicalibus nigris, nitidis. Antennis nigris, articulo primo olivaceo."

The habitat given by Kouchakevitch for this species is Russian America.

Pentatoma (Chlorochroa) Sayi Stal. (*Pentatoma grandosa* Uhler. Hayden's Survey of the Terr., 1872, p. 398).

This is the most easily recognized of our *Chlorochroas*. The narrow elongated form, the numerous smooth white points on the

pronotum, scutellum, and especially on the elytra, and the three large calloused points on the base of the scutellum are characteristic. The antennæ are black, with the first and sometimes the base of the second joint green. The ventral surface of the male genital segment is strongly produced. The colors vary exactly as in *C. ligata*. This seems to be a very abundant species throughout the Rocky Mountains, and Prof. F. H. Snow has taken it as far east as western Kansas. My material is from Montana, Idaho, California, Utah, and Colorado. In the latter State it has even become a serious pest in the grain fields during the past summer. I have taken it in greatest numbers from a low *Lonicera* growing on the foot-hills in Colorado.

Pentatoma Harrisii Westw

This species is so uncertain, both as to habitat and identity, it seems best to pass it for the present with the statement that Distant gives a good figure of it in Proc. Zool. Soc., 1900, pl. 53, fig. 2.

Carpocoris lynx Fabr.

Not uncommon throughout Colorado and the adjoining States. I have taken it at Ogden, Utah, and Prof. Wickham has sent me specimens from Williston, N. Dak., and from Prof. Cooley I have received some taken in Montana. Dr. Uhler records it from California. The pale green and pink of the upper surface gives this insect a very pretty appearance.

In Of. Finisk. Soc., xxvi, p. 32, 1884, Reuter has described a variety *longiceps* of this species. I have not seen this description, and cannot state how it differs from the ordinary form of the species.

Mormidea lugens Fabr.

This insect is common everywhere throughout the eastern United States and Canada, and is somewhat less abundant in the west from British America to Mexico. Say described it as *Pentatoma punctipes*.

Mormidea pictiventris Stal.

Mr. Samuel Henshaw has kindly prepared for me a list of the North American Pentatomids in the Museum of Comparative Zoology at Cambridge. This list includes a number of species not before recorded from our territory, and among them the present, which is credited to Texas.

Mormidea sordidula Stal.

Recorded from New Mexico and Texas within our territory. My material is from Mexico. This species is pale testaceous punctured with black, with the narrow apex of the scutellum, three points on its base, two on the disk of the pronotum anteriorly, and the slender outer margins of the pronotum and base of the elytra white and calloused.

Mormidea tetra Walker.

Prof. Wickham has very kindly sent me a specimen of this large pale species taken at Del Rio, Texas, in June. It is larger than the preceding species, has the white markings still more reduced, and the connexivum maculated. The venter wants the median vitta and the antennæ are entirely black. It has not before been recorded from north of Mexico.

Œbalus pugnax Fabr.

This is a southern species that reaches its northern limits from southern New York westward to Ohio and Iowa. In my collection are specimens from New Jersey, Washington, D. C., North Carolina, Georgia, Mississippi, Kansas, and Colorado, and Uhler records it from Texas, Arizona, and Florida. It also inhabits Cuba and Mexico. This is *Pentatoma augur* Say.

Genus **EUSCHISTUS** Dallas.

Margin of the abdomen somewhat calloused pale; connexivum marked with a black line within; pronotum quite convex behind; apical ventral segment with two smooth points ..... **comptus.**

Margin of the abdomen not calloused, or distinctly pale; connexivum usually maculated; pronotum but slightly convex behind; apical ventral segment without smooth points ..... 1.

1. Membrane normally distinctly dotted with fuscous; tergum in fully developed examples black ..... 2.

   Membrane destitute of dots; tergum rarely fuscous or black ..... 12.

2. Margin of the venter with a minute black point at each incisure ..... 3.

   Margin of the venter immaculate, angles of the segments concolorous .... 11.

3. Body strongly convex, especially below; humeri forming short acute but abrupt spines, distinctly inclined forward ..... **crassus.**

   Body less convex, sometimes obviously depressed ..... 4.

4. Apex of the head strongly incised; cheeks distinctly produced beyond the rounded apex of the tylus, subacute; elytra as wide as the abdomen. **fissilis.**

   Cheeks very little if at all longer than the tylus; elytra narrower than the abdomen exposing the maculated connexivum ..... 5.

5. Form not distinctly depressed, the sides of the pronotum sometimes a little expanded and reflexed before the humeri, in that case the middle of the venter marked with a row, sometimes incomplete, of black spots.6.
Form distinctly depressed especially within the lateral margins of the pronotum; venter without black spots.....9.
6. Size larger (12-14 mm.); venter without distinct black spots on the median line ..... 7.
Size smaller (under 12 mm.); venter with a row of black spots, sometimes almost obsolete.....8.
7. Humeri prominent, acute or rounded, never spinose; upper surface rather closely irregularly punctured; inhabits eastern and southern States. **servus.**
Humeri acutely spinose; upper surface paler; punctures more distinct and regularly disposed..... **impictiventris.**
8. Humeri prominent, rounded; fifth joint and apical half of the fourth joint of the antennæ black ..... **tristigmus.**
Humeri produced, acute or spinose; antennæ entirely pale or rufous. var. **pyrrhocerus.**
9. Size larger (over 10 mm.); punctures on the upper surface forming round black scattering dots, more noticeable on the elytra; genital segment of the male broadly concavely arcuated.....10.
Size small (under 10 mm.); latero-anterior margins of the pronotum almost rectilinear, pale, defined within by black punctures; genital segment of the male with a rather deep rounded median notch.....**politus.**
10. Legs dotted with black; apical portion of the fifth antennal joint blackish, second joint shorter than than the third.....**conspersus.**
Legs with not more than about four black points; apical two joints of the antennæ dusky, second and third joints subequal .....**inflatus.**
11. Pronotum with a raised calloused somewhat irregular line between the humeri; genital segment of the male without a black spot on its base. **ictericus.**
Pronotum without a continuous calloused line between the humeri; genital segment of the male with a blackish basal spot.....**variolarius.**
12. Size larger (11-12 mm.); punctures finer and closer on the head and anterior portion of the pronotum leaving an obvious but somewhat irregular pale vitta between the prominent subacute humeri, these punctures segregated so as to form scattering round black dots on the elytra. **bifibulus.**
Smaller (10 mm. or less).....13.
13. Form broad ovate; humeri prominent, acute; upper surface with scattering pale points; genital segment of the male rounded at apex, feebly sinuated at the middle..... **crenator.**
Form oblong; upper surface regularly and coarsely punctured; genital segment of the male broad at the apex and feebly trisinuated. **zopiloteusis.**

Euschistus fissilis Uhler.

This is one of the most abundant and widely distributed of our North American Pentatomids. It is found from Quebec to Van-

conver Island and toward the south ranges to Florida and Texas. It may be distinguished from *servus*, its nearest ally, by the incised apex of the head and the narrower abdomen, which does not extend beyond the sides of the elytra.

Euschistus servus Say. (*Pentatoma spilota* Westw. Hope Catalogue, i, p. 42, 1837.)

In the southeastern States this largely replaces the preceding species. I have not seen it from north of New Jersey and Ohio or west of Kansas, Texas and eastern New Mexico. I included this species in my List of the Hemiptera of Buffalo, but on a closer examination am convinced that that specimen was a form of *fissilis* with the apex of the head scarcely incised. There certainly seems to be a tendency in these two species to intergrade along the line where their areas of distribution overlap.

Euschistus impictiventris Stal.

The form I have identified as this species is closely allied to *servus*, but the pronotal angles are acutely produced. I possess a single example taken at Las Cruces, New Mexico, by Prof. T. D. A. Cockerell, and have seen another in the collection of Mr. Otto Heidemann that was labelled "*Euschistus proprius* Uhler." The species generally identified as *impictiventris* Stal is smaller and more depressed, having much the form of *conspersus* Uhler and *inflatus* Van D., with the latter of which I have identified it as a variety or race. It probably, however, should be considered a distinct species.

Euschistus inflatus Van Duzee. (Trans. Am. Ent. Soc., xxix, p. 107, 1903.)

This is the Rocky Mountain or western representative of *servus*. It occurs from Colorado to New Mexico, and may be distinguished from the eastern species by its broader and more depressed form, the more rounded apex of the scutellum, the fewer punctures and the rufous color beneath.

A smaller variety or race of this species, of which I have specimens from California and Idaho, has been determined by Dr. Uhler as *impictiventris* Stal. I do not, however, see how Stal's very short and inadequate description can be construed to fit this species. Comparing it with the form of *tristigmus* with acute humeri, Stal says that it is larger, which this is not, and that it has the same

acuminate humeri, which this form certainly has not. Two characters he mentions—the elevated apex of the tylus and the unspotted venter—are found in several allied species. To answer these few characters, the only ones given, it is necessary to select some species in this section of the genus, that is larger than *tristigmus*, with the apex of the tylus elevated, the humeral angles acute and the median row of black spots on the venter wanting. The form placed as *impictiventris* above is the only one known to me that does this.

Euschistus conspersus Uhler. Trans. Md. Acad. Sci, i, p. 388, 1897.

I have recently received from Rev. G. W. Taylor two females taken in Vancouver Island that answer in every particular to Dr. Uhler's description, except that in one the rufous flecks on the venter are wanting and in the other almost obsolete. I have no doubt but that this is the insect described by Dr. Uhler. Comparing these two specimens with a long series of *inflatus*, I find a few points for distinguishing the two species that seem to be constant. The antennæ in *conspersus* are rufous, with the apical two thirds of the fifth joint blackish; in *inflatus* the apical two joints are dusky except at base. In *conspersus* the second joint is distinctly shorter than the third; in *inflatus* these joints are subequal. In *conspersus* the scutellum is more convex on the base and narrower toward the apex than in *inflatus*, and has the extreme tip slenderly edged with white and obviously depressed; the latter character, however, I imagine may not be constant. In *conspersus* the legs are conspicuously dotted with black; in *inflatus* they have but about four black points in a row on the lower surface of the femora, and these may become pale or almost obsolete. The above characters will sufficiently distinguish these forms as at present known. It would not be surprising if further collecting in intervening localities should bring to light intermediate forms connecting these two species.

Euschistus politus Uhler. Can. Ent. xxix, p. 117, May, 1897.

A neat little species, of which I have seen but very few examples. The only one now in my collection was taken in Ohio by the late Dr. Kellicott. The small size, depressed form, and the pale margins of the pronotum, bordered within by a blackish shade, will sufficiently distinguish this species. Dr. Uhler records it from Massachusetts, Rhode Island, Pennsylvania, Maryland and the District of Columbia, Mrs. Slosson has taken it on Mount Washing-

ton, and apparently it is in Smith's Catalogue of the Insects of New Jersey under genus *Podisus*.

Euschistus tristigmus Say. (*inconspecta* Westw. Hope Catalogue, i, p. 42, 1837).

Common and widely distributed from northern Canada to southern Mexico. The typical *tristigmus*, of which the *luridus* Dallas is a strict synonym, is the more northern form, with prominent but rounded humeri and with the apical two joints of the antennæ, except at their base, black. In this form the ventral row of black spots is well developed, at least in all the specimens I have recently examined.

Var. *pyrrhocerus* H. S.? I have placed under this name the form with the humeri more produced, either acute or spinose, and the antennæ very little if at all darker on their apical two joints. In this form the ventral row of black spots is frequently reduced to a slender longitudinal line on the sixth ventral segment. It is more common to the south, where it seems to replace the other form.

Euschistus variolarius P. B.

Inhabits almost the whole of the United States and Canada, and is especially abundant in the northern States. In this species the humeri vary from subacute to spinose; the apical two joints of the antennæ are black, with the base of at least the fourth pale; the apex of the scutellum is usually slender, with the extreme tip pale, and the genital segment of the male has a rather large blackish spot near its base. From *fissilis* and *servus* it can be distinguished by its slightly smaller size and the absence of black points at the incisures on the edge of the abdomen. This is the typical "stinck-bug" or "berry-bug" of the northeastern United States.

? Euschistus jugalis Prov.

I have no knowledge of this species, except the description given by Provancher, but judging from that I would be very much inclined to consider it a not fully developed example of *fissilis* or *variolarius*. When not well hardened the juices are apt to settle under the pronotum forming a black spot or band there. The type was taken at Vancouver.

Euschistus ictericus Linn.

Found in the northern States and Canada across the whole width of the continent. It is generally to be found on sedges in swampy

spots or along the borders of streams or other bodies of water. It may be distinguished from the foregoing by the calloused ruga connecting the humeri which are more produced than in *variolarius*, and the genital segment of the male wants the black spot found in that species.

Euschistus crassus Dallas.

This seems to be a southern form. I have one specimen taken in Georgia by Prof. W. F. Scott, and another from Florida kindly given me by Mr. Heidemann. It is apparently a rare species. Its thick convex form with the short acute humeri pointing well forward will distinguish it from all our other species.

Euschistus zopilotensis Distant.

Described from Mexico. I have an example from Galveston, Texas, that differs only in having the humeri subacute. It has the convex elongated form of *strenus*, but the upper surface is more regularly punctured and not so roughly sculptured.

Euschistus crenator Fabr.

This common South American species has been recorded from Texas and Arizona, and Mrs. Slosson has sent me an example labelled "California." It may be distinguished by its small size, broad somewhat depressed form, acute prominent humeri and the narrow male genital segment which has a feeble sinus at apex. The upper surface is dotted with smooth pale points, and the edges of the pronotum are usually blackish and strongly serrated.

Euschistus bifibulus P. B.

I have received examples of this species taken in Florida by Mrs. Annie Trumbull Slosson and Prof. W. S. Blatchley. It has about the size and form of *variolarius*, but the pale immaculate antennæ and legs and the undotted membrane will distinguish it. The pronotum has a somewhat indefinite calloused ruga between the humeri.

***Euschistus comptus** Walker.

Some time ago Mr. Heidemann kindly sent for my inspection an example of this species that was taken in Texas. According to Stal it may be distinguished from all our other species by the pale calloused margin of the abdomen. A good figure is given by Distant, Pl. 1, fig. 11, of the Biologia.

Proxys punctulatus P. B.

Dr. Uhler records this species from Texas, Indian Territory, Louisiana, Georgia, Florida, and one specimen from so far north as Philadelphia. It is common in the West Indies and Mexico.

? Proxys albo-punctatus P. B.

Recorded from the southern States in Uhler's Check List. There is, perhaps, some mistake in this.

Cœnus delius Say.

Widely distributed and common in the United States and Canada but apparently precinctive. In the north it occurs from Quebec to Vancouver Island. Its southern range includes Florida and Texas.

Hymenarcys æqualis Say.

In our territory Dr. Uhler gives Maryland, the southern United States, Texas and the Indian Territory as the habitat of this species. I have seen specimens from New York City, New Jersey, Ohio, Kansas and Montana, and Prof. Cockerell records it from Colorado.

Hymenarcys nervosa Say.

This is a larger oval species that seems to have about the same range as the preceding. I have never succeeded in taking either of them about Buffalo, although both occur near here. Provancher records *nervosa* from Quebec, and Dr. Felt has sent me a specimen taken at Albany, N. Y.

***Hymenarcys crassa** Uhler. Trans. Md. Acad. Sciences, i, p. 387, 1897.

I have not yet seen this recent addition to our fauna. The type was from Arizona.

Elia americana Dallas.

Apparently a rare and local species. I have taken it in the suburbs of Denver, Col., and have seen specimens from Manitoba (Hanham), Nebraska (Wickham), and Montana (Cooley). Dr. Uhler records it from Dakota, and Provancher has taken it in Quebec.

Genus **NEOTTIGLOSSA** Kirby.

Upper surface of the head almost flat transversely, not tumidly elevated within the lateral margins ..... **undata.**

Upper surface of the head strongly tumid within the lateral margins . ..... 1.

1. Deflected anterior portion of the head strongly impressed forming an excavated basin in which the tylus is not all elevated ..... **cavifrons.**

Deflected anterior portion of the head a little impressed each side of the tylus, not forming an excavated basin; tylus quite distinctly elevated to its apex ..... **sulcifrons.**

Neottiglossa undata Say.

A common species, especially in the northeastern United States and Canada. In the latter country it is found from Quebec to Vancouver Island. Its southern range, so fas as I can now learn, is New Jersey, Illinois, Nebraska and Colorado.

In 1877 Dr. Uhler separated the *trilineata* Kirby, assigning to this name a larger dark colored form taken in Canada, Nebraska, Dakota and California. I have never been fortunate enough to see one of these dark specimens and will not now venture to give any characters separating the two forms.

Neottiglossa sulcifrons Stal.

This species seems to be most at home in the southern States, although Dr. Uhler records it from as far west as New Mexico, Texas and Utah. I took one example at Griffin, Georgia, in May, 1899, and Mr. Heidemann has kindly sent me a specimen from Washington, D. C. Prof. Osborn has specimens from Kansas and Nebraska.

Neottiglossa cavifrons Stal.

I captured one individual of this species at Ogden, Utah, in July, 1900, and have seen another from Utah taken by Mr. Heidemann. The type came from Texas, and Prof. Osborn has a specimen from California. It may be separated from *sulcifrons* by the characters given by Stal in the Enumeratio, ii, p. 18, but the two species are close and possibly should be considered but varieties of a single form.

Genus **COSMOPEPLA** Stal.

The following key is a copy of that part of Montandon's synopsis that applies to our species:

Scutellum very obtusely rounded at the extremity; frenum very short, not quite one third the length of the scutellum; shape of the body broadly oval ..... 1.

Scutellum less obtusely rounded at the extremity; frenum reaching almost one half of the length of the scutellum; the body a little longer than that of the preceding group; above slightly brassy and thickly punctured ..... 2.

1. Scutellum black with a red spot on each side near the apex; transverse fascia and longitudinal central spot of the pronotum narrow linear; abdomen above narrowly edged with red ..... **carnifex.**

Scutellum entirely concolorous, transverse fascia of the pronotum irregular, broadened in the middle, slightly elevated; abdomen beneath broadly edged with ochraceous; this margin inwardly sinuated opposite each stigma ..... **Uhleri.**

2. Transverse yellowish ochraceous fascia of the pronotum irregular, slightly elevated; scutellum punctured to the apex; narrowly edged with yellow at the apex; abdomen beneath broadly edged with yellow; yellow margin deeply sinuated on each segment; stigmata black. **conspicillaris.**

Transverse yellowish ochraceous fascia of the pronotum shining, regular; apex of the scutellum more broadly edged with yellowish ochraceous ....3.

3. Scutellum punctured near the apex on the yellowish ochraceous part; transverse fascia of the pronotum extended backward to near the base of the pronotum; two dark spots in the middle of the fascia; abdomen beneath with the lateral margins broadly pale ochraceous; a segmental series of small dark rounded spots covering the stigmata..... **binotata.**

Apex of the scutellum shining; impunctate on the yellowish ochraceous part; transverse fascia of the pronotum not extended backward, impunctate, slightly elevated; abdomen beneath with pale ochraceous lateral margin of equal width, including the stigmata..... **decorata.**

Cosmopepla carnifex Fabr.

One of the most abundant of the Pentatomids occurring in the eastern United States and Canada. Its western limits seem to be Texas, Colorado and Washington, but it is much more at home east of the Rocky Mountains as far south as Mississippi. It was redescribed as *Pentatoma bimaculata* by Thomas, in Trans. Ill. State Ag. Soc., v, p. 455, 1865.

***Cosmopepla Uhleri** Montd. Proc. U. S. Natl. Museum, xvi, p. 48, 1893.

I have not yet seen this species. It is described as "castaneous," so it should be easily recognized from our other species. The types came from Nevada and California.

Cosmopepla conspicillaris Dallas.

I have specimens of this species from Colorado and Montana (Cooley), and California (Heidemann). Its range extends from Vancouver Island to Mexico and Lower California. It seems to replace *carnifex* west of the Rocky Mountains.

***Cosmopepla binotata** Distant.

Montandon reports having seen a specimen of this Mexican species from Wisconsin in the collection of M. Lethierry.

Cosmopepla decorata Hahn.

Distant records this species from Texas and Arizona. My specimens from Lower California were kindly given to me by Dr. Uhler. The deep blue-green ground color with orange and white markings make this our most showy species of *Cosmopepla*.

Eysarcoris intergressus Uhler. Proc. Ent. Soc. Wash., ii, p. 368, 1893.

Described from Kansas, Utah and California. I have specimens from Colorado, Idaho (Aldrich), Montana (Cooley), and Vancouver Island (Taylor). It seems to have about the same range as *Cosmopepla conspicillaris*. I have seen this in collections labeled *Eysarcoris melanocephalus*, a European species that probably does not occur in this country, and Dr. Uhler figures it under this name in Bull. U. S. Geol. & Geog. Surv., Vol. ii, No. 5, pl. 19, fig. 7, 1876.

Menecles incertus Say.

Widely distributed in the United States, but apparently nowhere abundant. Dr. Uhler records it from Massachusetts, Pennsylvania, Illinois, Missouri, Kansas, Nebraska and California, Stal from Arkansas, and Prof. Osborn reports it as rare in Iowa. I have seen specimens taken in Ohio by the late Dr. Kellicott, and near Ottawa, Canada, by W. H. Harrington. It was once taken in numbers from small hickory trees growing near Lewiston, N. Y.

Prionosoma podopioides Uhler.

This western species has been reported from Vancouver Island, Colorado, Utah, Nevada, California and southward through Arizona and New Mexico to Lower California. Lethierry and Severin in their Catalogue include *villosa* Prov. as a distinct species, but I can see no possible justification for this as his description answers in every respect to the ordinary form of *podopioides*.

Genus **THYANTA** Stal.

Size medium or large (for this genus); second joint of the antennæ little or not at all longer than the third ..... 1.

Size small; second joint of the antennæ considerably longer than the third ... 3.

1. Size medium (8-9 mm.); punctuation coarser, less dense; the intervening surface rugosely uneven; edge of the abdomen with black points. **casta.**

Size larger (9-12 mm.); punctuation close and regular; intervening surface even or with a few raised points..... 2.

2. Humeri acutely spinose; edge of the abdomen fulvous with black points. **perditor.**

Humeri obtuse or acute, not spinose; edge of the abdomen sometimes pale but without distinct black points ... **custator** and **pallidiventris.**

3. Head short, narrowed before the eyes to the rounded apex, the sides not at all parallel; surface closely and evenly punctured ..... **brevis.**
Head longer, sides distinctly parallel before the antennæ, apex broad, rounded ..... 4.

4. Color dark green; tip of the scutellum and a band connecting the humeri, scolloped posteriorly, pale or in part sanguineous.... **antiguensis.**
Color green or greenish white, without pronotal band ..... 5.

5. Connexivum distinctly maculated; venter with a row of black points on the hind edge of each segment .. .. **punctiventris.**
Connexivum immaculate or with nearly obsolete spots; black points on the venter wanting ..... **rugulosa.**

Thyanta perditor Fabr.

This species seems to be more typical of the West Indies and Mexico. According to Dr. Uhler it is found in the eastern United States as far north as Savannah, and in the west from Nebraska to Colorado and Arizona. Prof. Osborn records it from South Dakota and Prof. Cockerell has taken it in New Mexico. This species varies in about the same manner as *custator*, but in all the specimens I have seen the humeri are produced in acute spines, the edge of the abdomen is fulvous with conspicuous black points, and the stigmata are black. In my collection the specimens from Mexico and the West Indies have the pronotal band more pronounced.

Thyanta custator Fabr.

A variable and widely distributed North American species which becomes more abundant toward the south and west. I have seen specimens from New York to Vancouver Island and south to Arizona but in the east at least it is rare to the north of New York City. The sanguineous band on the pronotum is generally wanting in specimens from the north and east. Sometimes there are black points on the stigmata and at the incisures on the edge of the abdomen, but generally these are wanting, and the connexivum is concolorous. On the hot arid prairies of the west the color becomes whitish green, and when immature it is often of a testaceous color.

Thyanta pallido-virens Stal.

I have seen two or three specimens from Utah and California that agree in all particulars with Stal's description of this species, but I can find no characters that will satisfactorily distinguish

them from *custator*. For the present I prefer to leave them without further attempt at discrimination.

Thyanta casta Stal.

My specimens are from Hayti, but the species has been recorded from California and Arizona by Dr. Uhler. I have distinguished *casta* from *custator* by the punctuation, which is coarser in *casta*, not so deep and close, and the intervening surface is uneven, in places irregularly calloused. It closely resembles the South American *patruelis* in size and form. In my specimens the margins of the pronotum before the humeri are not distinctly pallid or luteous, but the extreme edge in one specimen is slenderly blackish, a character often found in not fully developed examples of *custator*.

Thyanta antiguensis Westw. (*tæniola* Dallas).

Dr. Distant announces (Proc. Zool. Soc., 1900, p. 812) what all students of the Pentatomids must regret, that the awkward name given by Westwood must supplant that of Dallas. I possess a good series taken in Mexico and Hayti, the latter kindly sent to me by Prof. Elmer D Ball. This species varies in length like *rugulosa* from about 5½ to 7 mm. In general appearance it most closely resembles *punctiventris* with which it agrees in its somewhat depressed form. It may best be distinguished by its coarse, deep, uniform punctuation, and the testaceous band between the humeri. This band is scolloped behind where it is margined with deep brown or sanguineous. The head is about as long as in *rugulosa* and *punctiventris*, but is more strongly narrowed toward the apex. The color above is dark green, not bright bluish or pea green as in *rugulosa* and *brevis*. Here the venter is paler, coarsely and sparcely punctured with darker. In all my specimens the edge of the venter is marked with four black points placed on the second to the fifth incisures, and the tip of the scutellum is dull sanguineous. It has been recorded from Arizona and California.

Thyanta rugulosa Say.

This species is exceedingly common on the dry arid prairies of Colorado and Utah. While collecting in such localities in 1900 I found it most abundant on a low species of *Atraplax* having a whitish green foliage. On these bushes the insect assumes a green grey color assimilating to the color of its surroundings. The insect which I believe I have correctly identified as *rugulosa* has the head long,

with a blunt apex, the edges of the pronotum are sharp and concavely arcuated, with the humeral angles prominent, rounded, or scarcely angled, and crossed on its anterior disk by a slender, slightly elevated ridge, reaching to the middle of the callosities on either side. The whole upper surface, but especially the pronotum and elytra, are coarsely and rugosely punctured, giving the insect at times a coagulated or mottled appearance. The tergum is black, with the apex beyond the tip of the scutellum and the sides green. In pale examples the connexivum is obscurely marked with brown at the incisures where there is also a black dot on the extreme edge, and sometimes there is an indication of a brown point on the base of the membrane on either side of the tip of the scutellum.

I have examined a long series of this species taken at Grand Junction, Colorado, and have found it not uncommon at Pueblo, Rifle, and at other localities in that State and Utah where the prairies are covered with a sparse growth of *Atraplax* and similar vegetation. I have also received a specimen from Prof. Wickham, taken at Havre, Montana. Other specimens formerly received by me from correspondents and determined as *rugulosa* may belong to the next species which possibly is but a pale variety of this. I venture, however, to describe it as new as it is sufficiently distinct to require a varietal name in any case.

Thyanta punctiventris n. sp.

Proportionately longer and more depressed than *rugulosa*. Sides of the pronotum distinctly concavely arcuated. Humeral angles prominent, obtuse. Head long, sides distinctly sinuated before the eyes, then subparallel to the broad rounded tip. Apex of the scutellum narrow, subacute. Membrane surpassing the tip of the abdomen, whitish, dotted with brown toward the base. Connexivum maculated at the incisures. Venter coarsely punctured with greenish brown and marked with a transverse row of about eight or ten black points close to the hind margin of each segment. Mesosternum with a black vitta on each side and there may be a curved black streak on the propleura behind the eye. Color pale or whitish green, above coarsely punctate and irregularly mottled with dark green, intermixed, especially on the pronotum and elytra, with some pale calloused dots or rugæ. The legs are punctured with darker and the femora have an obscure band before their apex; tarsi and usually the apex of the tibiæ blackish. Antennæ pale with the apical joint and sometimes the fourth more or less obscured. Length to the tip of the membrane 6 to 7 mm., width across the humeri 3½ to 4 mm.

This species is closely allied to *rugulosa*. It may best be distinguished by its more elongated and depressed form, the broad macu-

lated connexivum, the rows of dots on the venter, the narrow tip of the scutellum, and by the slightly wider apex of the head. The tergum is black in this species as in *rugulosa*, with the sides and apex green. The pronotum is depressed within the lateral margins leaving the edges sharp, and there is a transverse linear elevation occupying the position of the callousities.

Described from twelve examples representing both sexes. Several of these were taken by me at Grand Junction, Colorado, in July, 1900; five, received from Prof. Wickham, were taken by him at Williston, North Dakota, June 8th and 9th; one received from Mr. Otto Heidemann was taken at Salt Lake City, Utah, June 14th, and one was taken in Colorado by Prof. E. D. Ball. The two latter came to me labelled *Thyanta rugulosa*.

Thyanta brevis n. sp.

Small, oval, convex. Head shorter and more narrowed toward the apex than in any of the allied species, the edges broadly sinuated before the eyes then converging to the rounded apex. Head, pronotum and scutellum closely, evenly and rather finely punctured, the surface without the smooth sphacelated spots frequently so noticeable in *rugulosa* and *punctiventris*. Pronotum convex, a little impressed within the lateral margins which are sharp and nearly rectilinear or very feebly sinuated anteriorly. Humeral angles almost rounded. Scutellum short with the apex proportionately broad. Membrane as long as the abdomen in the females, a little longer in the males. Venter coarsely, rugosely, but not deeply punctured. Color as in the allied species varying from bright pea green to almost white. In green examples somewhat paler on the front of the pronotum, base of the scutellum, and beneath, especially toward the median line. Membrane with two blackish spots at base placed on either side of the apex of the scutellum. Mesosternum with a black spot on either side between the anterior and intermediate coxæ. Eyes, last joint of the antennæ, and sometimes the apex of the fourth joint, tarsi and apex of the tibiæ blackish. Connexivum immaculate. Tergum black on the two basal segments. In fully colored examples the thin reflexed edges of the pronotum are pale, becoming rosy on the humeral angles. Length 5½ mm., width across the humeri 3 mm.

Described from ten examples taken by me at Grand Junction, Colorado, July 28, 1900. Like its congeners this insect becomes pale or almost white when it occurs on the low whitish *Atraplax* and other prairie vegetation growing on the parched deserts of the arid regions. This is the smallest *Thyanta* known to me. It may be recognized by its oval convex form, fine even punctuation, the two blackish spots at the base of the membrane, and especially by the short narrowed head. The spots at the base of the membrane, although apparently always present in *brevis*, cannot be relied upon

to distinguish the species as they are sometimes indicated in *rugulosa* and generally in *punctiventris*.

Loxa flavicollis Drury.

Dr. Uhler records the capture of this fine insect in New Mexico and Texas, and Mrs. Slosson has taken it in Florida.

Murgantia histrionica Hahn.

This common cabbage pest of the southern States has spread northward to the vicinity of New York City, southern Ohio, Indiana, Kansas, Colorado and California. Prof. Osborn thinks it has about reached the northern limits of its distribution (Proc. Ia. Acad. Sci., I, pt. iv, p. 121, 1893).

***Murgantia varicolor** Westw. (*munda* Dallas).

Accredited to "Western States" in Uhler's Check List.

Murgantia violascens Westw.

Mr. G. Beyer of New York City has recently sent me a pair of this beautiful species taken by him at Key Largo, Florida. This is its first recorded occurrence within our territory. It may be distinguished from *munda* by the markings of the scutellum and elytra which have been carefully described by Dallas. In *violascens* the median pale line of the scutellum reaches the apex, before which it is joined by the pale lateral vittæ, and the membrane is fuliginous with a hyaline border.

Vulsirea violacea Fabr.

I am indebted to the kindness of Dr. Uhler for an example of this beautiful species that was taken in Florida, and Mrs. Slosson has another taken in the same State. I do not find that this species has before been recorded from our territory.

Genus **NEZARA** A. and S.

Osteolar canal short and truncated at apex ..... **viridula**.
Osteolar canal long and curved, becoming gradually evanescent ..... 1.
1. Form short oval, sides of the pronotum strongly arcuated; head short, the cheeks exceeding the tylus; margins of the abdomen concolorous with black points at the incisures ..... **pennsylvanica**.
Form ovate; sides of the pronotum almost rectilinear; head longer; tylus equalling the cheeks; margins of the abdomen fulvous with black points at the incisures ..... 2.

2. Apex of the genital segment of the male nearly transverse, distinctly trisinuate, the outer apical angles acute; inhabits the northern States and Canada.....**hilaris.**

Apex of the genital segment of the male quite deeply and subacutely emarginate, very obscurely sinuated, the outer apical angle obtuse; inhabits Mexico and the West Indies.....**marginata.**

Nezara pennsylvanica De Geer.

This distinct species seems to be rare and local. I took one specimen with the young at Woodbine, N. J., in August, 1902, and have seen three others from the same State. Prof. D. S. Kellicott once sent me an example captured in Ohio, and more recently Mr. Chagnon has taken one at Montreal. Prof. Osborn records it from Iowa, and Dr. Uhler from New Jersey, New York, Massachusetts and Illinois, and Say's type (for *abrupta*) was from Georgia. Dr. Distant includes it in the Biologia material.

Nezara viridula Linn.

Dr. Uhler says that in the United States this species inhabits the littoral plains from Virginia to Florida and Louisiana. It may be roughly distinguished from the two following which it closely resembles by the longer head, concolorous abdominal margins and the short truncated osteolar canal. For the Westwood synonyms of this species see Distant's paper in Proc. Zool. Soc., 1900, p. 818.

Nezara marginata P. B.

According to Dr. Uhler this southern species inhabits the coastal region of southern Florida and Texas. I have seen a specimen taken in Arizona by Prof. F. H. Snow and another taken in California by Mr. D. W. Coquillett, and Mr. Townsend has taken it on *Cereis* in Arizona.

Nezara hilaris Say.

This is a showy but very common insect throughout the northeastern United States and Canada. Toward the south its range extends through the southern States and West Indies to Brazil. In the West it occurs in Kansas, Iowa, Colorado, Montana, Utah, Arizona and Texas, and perhaps over all the western States. This is a larger species than *marginata*, and is more oblong in form with the apex of the scutellum more slenderly produced. The form of the male genital segment is quite distinctive and will at once distinguish the species.

Genus **BANASA** Stal.

Stal did not separate this genus from *Nezara* in his Synopsis but the next year he characterized it in the Rio Janeiro Hemipter-Fauna, and in 1873 Uhler described it under the name *Atomosira*. Distant says in the Biologia: "This genus is closely allied to *Nezara*. The body is subovate and less oblong, head sinuated on each side, lobes of equal length and apex rounded. This is another of those genera in which the differences seem more apparent than real; the shape of the body and different coloration gives *Banasa* a more distinct appearance from the genus *Nezara* than structural details fully carry out." The following key may assist in distinguishing our species:

Apical angle of the abdominal segments slightly prominent, acuminate.....1.
Apical angle of the abdominal segments obtuse, not prominent.....2.

1. Head distinctly narrowed before; edge of the abdomen with conspicuous black points; second joint of the antennæ a little shorter than the third. **calva.**
Head broad before; margins of the abdomen with minute points; second joint of the antennæ about half the length of the third....**dimidiata.**

2. Color clear green; basal angles of the scutellum with a large white calloused spot.....**euchlora.**
Basal angles of the scutellum without the white calloused spot.....3.

3. Upper surface quite closely and regularly punctured.....**sordida.**
Upper surface with large distant punctures, irregularly disposed. **Packardi.**

Banasa calva Say (*cativus* Dallas).

After a careful study of a long series of this species and the *dimidiata* I am compelled to change my former determination. Say's description of *calva* agrees perfectly with some southern specimens in my collection of the form I have formerly determined as *cativus*. Material from the north in this species have the colors paler but do not differ otherwise. They are a little larger and more attenuated posteriorly than *dimidiata;* the head is very plainly narrower toward the apex, which certainly is not the case in *dimidiata;* the second joint of the antennæ is uniformly longer, and the colors are always paler than is usual in *dimidiata*. On the venter the punctures along each side are fewer and less strongly contrasted in *calva*; the lateral incisures are marked with a conspicuous black point, and the genital segment of the male is narrower. About Buffalo this species is tolerably abundant on various deciduous trees from August to October. I have received examples from Georgia and have seen others

from Montana (Cooley). Say's type was from Virginia. For some reason Stal failed to locate this species in *Banasa* in the Enumeratio, and possibly, on that account, it was not properly placed in the Lethierry and Severin Catalogue.

Banasa varians Stal.

A southern species that has recently been recorded from Las Vegas Hot Springs. New Mexico, by Dr. Uhler (Proc. U. S. Nat'l Museum, xxvii, p. 351, 1904). It may be distinguished from *calva*, which it closely resembles, by its shorter head and the absence of black points at the incisures on the margins of the venter. From *dimidiata* it differs by the longer second antennal joint, the different punctuation and the absence of black points on the margins of the venter. The record adding this species to our fauna was received too late to allow of its inclusion in the accompanying synopsis of our species.

Banasa dimidiata Say.

This is a common and widely distributed species. The types were from Georgia and Florida, and I have seen specimens from most of the eastern States, Colorado, Utah, North Dakota and Montana. In Canada it ranges from Quebec to Vancouver Island. When fully colored this is one of our most beautifully colored Pentatomids. It is quite variable in size, punctuation and the convexity of the pronotum. The larger eastern specimens I have heretofore determined as *calva*, and the smaller western form as *dimidiata*, but there seems to be no line of demarcation between them, and I can now see no reason for keeping them separate.

Banasa sordida Uhler.

Dr. Uhler describes this species from Massachusetts, Maryland and Virginia, and later recorded it from New Mexico. It is included in the Gillette and Baker List of the Hemiptera of Colorado, and more recently I have examined specimens that were taken in Arizona, and a deeply colored pair taken in Vancouver Island by Rev. G. W. Taylor. It differs from *Packardi* in being more strongly and densely punctured, and the color is darker, or even brownish chestnut, with the apex of the scutellum more broadly white, and the black dots on the edge of the abdomen much larger.

Banasa Packardi Stal.

This species is well described by Stal, and may be distinguished by its coarse, distant, irregularly disposed punctures. My only specimen is from St. Augustine. Stal describes it from North Carolina; the Museum of Comparative Zoology has examples from Georgia; and in Prof. Smith's List of the Insects of New Jersey it is accredited to "Sea Isle City, N. J."

Banasa euchlora Stal.

The clear light green color of this pretty insect with the white spot at the basal angles of the scutellum will readily distinguish it. Stal records it from Texas and South Carolina; Uhler from Maryland, Florida and Indian Territory; Osborn from Iowa, and I have seen others from Georgia.

Piezodorus Guildingi Westw.

In giving the distribution of this species in his paper on the Heteroptera of Grenada, Dr. Uhler a accredits it to southern Florida, and Prof. Osborn has recently sent me an example captured in New Mexico.

Piezodorus incarnatus Germar.

From Mr. Otto Heidemann I have received an example of this European species that is labelled "Jacksonville, Fla.?" It has not before been recorded from this side of the Atlantic, and if taken in Florida has doubtless been introduced there. It is a larger species than the preceding, and well distinguished by the deep black tergum bordered without by the pale yellowish connexivum. The inner field of the elytra and base of the pronotum are shaded to dark castaneous; the color on the pronotum, however, is not differentiated before by a pale band as in *Guildingi*. The large black stigmata are, perhaps, characteristic of the genus, as is the long ventral spine which passes the intermediate coxæ.

Arvelius albopunctatus De Geer.

Dr. Uhler records this from Arizona, California and Florida. I have seen specimens taken in the latter State by Mrs. Slosson. It is readily distinguished by the sharp projecting apex of the cheeks, the acute humeral angles, the pale general color, with white calloused points on the elytra, and a few scattering black punctures over the rest of the surface.

Genus **LIOTROPIS** Uhler.

Bergroth, in Revue d'Entomologie, Vol. X, p. 228, 1891, substituted the name *Dendrocoris* for that given by Uhler, but doubtless, for some very good reason, this change was not accepted by Lethierry & Severin in their Catalogue. Our four species may be distinguished as follows:

Head not longer than broad; inner angles of the connexivum marked with a square black spot.....**fruticicola.**
Head longer than broad; connexivum with or without spots on the outer margins, immaculate within.....1.
1. Head broad at apex; outer edges of the connexivum with a black spot at each incisure.....**humeralis.**
Head distinctly narrowed at apex.....2.
2. Humeri prominent, forming an obtuse or right angle; anterior one half of the pronotum blackish; punctures in part dusky....**contaminatus.**
Humeri rounded; punctures concolorous or nearly so; form more elongated and regularly oval.....**pini.**

Liotropis humeralis Uhler.

Our most abundant and widely distributed *Liotropis*. I have looked in vain for it about Buffalo, but it is found throughout New England, in New Jersey, Maryland, Pennsylvania, Ohio, Georgia, Iowa, Kansas, Colorado and California. In Colorado I have beaten it in numbers from scrub oaks growing in the Garden of the Gods, and on the adjacent mountain sides, and in most similar situations where I there collected.

Liotropis fruticicola Bergroth.

The only specimen I have of this species was kindly given to me by Mr. Otto Heidemann. It is a male captured in Key West, Florida, and I have seen a female taken in the same State by Mrs. Slosson. This species may be best distinguished by the short and broad head; the third joint of the antennæ is shorter than the first two, while in *humeralis* it is longer; the stigmata are black and the connexivum on its *inner* margin is marked by a black spot at each incisure; the pronotum is more convex, the sides less deeply sinuated, the humeral angles are somewhat less prominent than in *humeralis*, and the two black points on the posterior disk are more conspicuous. Bergroth has well distinguished this from *humeralis*, the only species with which it can be confounded.

Liotropis contaminatus Uhler (Trans. Ind. Acad. Sci., I, p. 190, 1897).

This pretty species may readily be distinguished from the preced-

ing by the broader form, the narrower and more pointed head, the pale yellowish color with the anterior lobe of the pronotum blackish. The pronotum is shaped about as in *fruticicola*, but it is less convex and sometimes there is an obsolete median carina. The pale color is often well obscured by blackish punctures. The types were from Arizona, but Prof. Wickham has sent me some that were captured in the Inyo Mountains, California, in July, at an altitude of 7000 to 9000 feet, and Prof. Osborn has a few examples taken at El Paso, Texas, in July, by Prof. Wickham.

Liotropis pini Montondon (Proc. U. S. Nat. Mus., xvi, p. 51, 1893).

Distinguishable from our other species by its regularly ovate form, rounded humeral angles and uniform coloration, which varies from pale ochraceous to ferruginous or almost rufous. The head is narrowed anteriorly as in *contaminatus*, there is a short median carina at the anterior margin of the pronotum, the third joint of the antennæ is twice as long as the second, but shorter than the first two together, and there is a small impunctate area on the disk of each elytron. The whole insect is unusually depressed even for this genus. It varies in length from 5 to 8 mm. The types were from the Argus Mountains in California, but in Prof. Osborn's collection are specimens from Arizona and Texas, and Prof. E. D. Ball has kindly given me one taken in Colorado.

Edessa bifida Say.

Dr. Uhler records this insect from Florida and Louisiana. It doubtless inhabits the whole southern coastal region of the United States. So far as I can learn this is the only species in this large tropical American genus that extends its range northwardly into our territory.

Subfamily Asopidæ.

A good synopsis of this subfamily by Stal may be found in his Bidrag till Hemip. Systematik; Of. k. Vet.-Akad. Förh., xxiv, pp. 495–499, 1867. Our genera are also included in Summer's Synopsis of the Nearctic Pentatomidæ.

Stiretrus anchorago Fabr.

Of this extremely variable species I have seen but three well-marked varieties:

Var. *fimbriatus* Say.—Figured in Am. Ent., pl. 43, upper left figure. Say's specimen came from Pennsylvania. Dr. Uhler re-

cords it from Massachusetts and Maryland, and adds that "it is not uncommon in all the States north of Virginia." I have recently seen an example in the Cornell University collection, that was taken near Ithaca, N. Y.

Var. *pulchellus* Westw.—I have a typical example of this variety from Baton Rouge, Louisiana, taken in May, and have seen another from Del Rio, Texas, taken by Prof. Wickham in June. This variety is much larger than *fimbriatus*, and is of a deep blue black color marked with orange.

Var. *violaceus* Say.—Prof. Osborn has sent me for study one individual of this variety taken by Prof. Wickham at Del Rio, Texas, in June, and Dr. Uhler records it from Pennsylvania, Georgia, Florida and Texas.

*Var. *personatus* Germar.—Dr. Uhler records this variety from Pennsylvania. I have not yet seen it.

Stiretrus anchorago as a species has been recorded from about all the southern States, and as far north as Iowa and Massachusetts. Southwardly it extends through Mexico to Panama. Two of the varieties are figured on Plate I of the Biologia.

Oplomus dichrous H. S.

Another very variable southern species of which I possess examples taken in Nogales, Arizona, in August, by Prof. Wickham, and an individual taken in a greenhouse in Philadelphia. This species in all its varieties may be distinguished from its congeners by having the anterior edge of the prosternum produced in a rounded lamina either side of the base of the rostrum. The head is narrowed at the apex, and in the male the cheeks are prolonged, contiguous, and strongly depressed before the apex of the tylus.

Genus **PERILLUS** Stal.

Form somewhat depressed; pronotum scarcely raised above the level of the scutellum ..... **confluens.**

Form more convex; pronotum quite strongly convex above the base of the scutellum ..... 1.

1. Anterior femora with a blunt tubercle in place of a spine ..... **exaptus.**
   Anterior femora with a stout spine ..... 2.
2. Surface finely and closely punctured, anterior margin of the sixth ventral segment broadly rounded; antennæ black, with metallic-green reflections ..... **splendidus.**
   Surface coarsely punctured, anterior margin of the sixth ventral segment quite distinctly produced in an angle more or less obvious ..... 3.

3. Antennæ black, basal joint and incisures only pale... ..... **bioculatus.**
Antennæ black, first two joints and basal half of the third rufous.
circumcinctus.

Perillus confluens H. S.

Dr. Uhler reports this species from Texas and New Mexico, Prof. Cockerell from Colorado, and Prof. Osborn has an example taken at Tuscan, Arizona, by H. F. Wickham. It is included in Prof. Smith's List of the Insects of New Jersey, but I strongly suspect that this is an error of determination. Possibly the closely related *Mineus strigipes* was the insect intended.

Perillus exaptus Say.

In this pretty and variable species the spine on the inner face of the anterior femora is reduced to a mere tubercle. The whole upper surface is closely and deeply punctured. The antennæ are black, with the incisures and sometimes the base of the first joint pale, and the head is strongly deflexed. Of this species I have before me the following varieties:

Var. *a*, *variegatus* Kirby.—Color yellowish fulvous, marked with black as follows: head, excepting the narrow fore borders and sutures beneath; pronotum, excepting a broad transverse band anteriorly; scutellum, excepting a broad submarginal vitta; elytra within; some large spots on the breast and venter, and the legs in part. Colorado and Montana. In July of this year I took an example of this pattern at Fort Collins, Colorado, in which the color on the pronotum is deepened to crimson, and Dr. E. P. Felt has sent me one taken at New Russia, New York, in which the pale color over the whole insect is of a rich crimson red. In all of these there is a narrow black border on the base of the pronotum before the scutellum. *Zicrona marginella* Dallas is a red form of this variety.

Var. *b*.—Pale whitish yellow. Head crimson red with the base, tylus and slender outer margins black. Pronotum with a transverse band before that is deflected and runs parallel to the outer margins almost to the humeri, and an arcuated band on the hind margin before the base of the scutellum black; between these black bands is a broad arcuated crimson band connecting the humeri and slenderly edged with the pale ground color. Scutellum with a median longitudinal vitta, abbreviated at either end, and the narrow lateral margins almost to the tip black; at either side at base is an oblique

crimson spot. Elytra with a wedge shaped longitudinal median vitta. Connexivum black, edged with pale. Beneath: pleural pieces with a lateral crimson spot on each side bordered with black, the intermediate smaller; venter crimson, the base and a connected longitudinal curved vitta on each side, and the genital segment black. Rostrum and femora rufous, tibiæ and tarsi black, the former lineated with pale. Antennæ black, basal joint rufous, the next incisures pale. One example of this gaudily marked variety taken in Colorado is in the collection of Prof. Herbert Osborn, and two from Wyoming are in the Museum of Comparative Zoology at Cambridge.

Var. *c.*—Deep black; pronotum, except the base and broad anterior disk, wide margins of the propleura, and the disk of the venter crimson red. This is another beautiful variety of which I took one specimen at Salida, Colorado, in July, 1900.

Var. *d.*—Entirely black or with the costal margin narrowly pale. One specimen from Colorado (Ball), and another from the Cornell University collection taken at Olympia, Wash., by Mr. Kincaid.

This species in some of its varieties seems to extend across the entire continent from New England and Quebec to Washington and Vancouver Island, and southward to New Jersey in the east and New Mexico in the west.

Perillus splendidus Uhler.

Dr. Uhler records this from California, Texas and Lower California, and Prof. Osborn from Colorado. My only specimen, from Los Angeles, California, was kindly presented to me by Mr. Otto Heidemann. It corresponds very closely with Uhler's description.

Perillus bioculatus Fabr.

This is the *Pentatoma clauda* (*clanda*) of Say. In adopting the Fabrician name I am merely following the lead of the Lethierry and Severin Catalogue. It is a common insect in certain parts of the Rocky Mountain region. My specimens are from Colorado, Nevada (Wickham), Idaho, Montana, New Mexico (Cockerell), and Kansas. Dr. Uhler also records it from California, Utah and Arizona, and Prof. Osborn from Iowa and Oregon.

There are two quite distinct varieties or styles of marking in this species: the typical *bioculatus* Fabr., which is black, with the characteristic markings varying from pale rufous to crimson, and the

elytra black, with the costa narrowly pale. This form includes the varieties "*b*" and "*c*" of Say's *Pentatoma clauda*. The other form is of a chestnut brown or piceous black, with the characteristic markings ivory white, and the elytra white, with the narrow inner margin and a wedge shaped median vitta black. This variety is the typical *clauda* of Say, and also includes his variety "*a*." This form bears quite a strong resemblance to the figure of *Perillus virgatus* Stal on Plate 3, figure 22, of the Biologia. In the specimens I have seen of the typical variety *clauda* Say, the base of the antennæ are blackish, not rufous as described by Say.

Perillus circumcinctus Stal.

This species seems to replace the preceding in the eastern United States and Canada. In the west it extends from Manitoba to Missouri, and possibly southwardly to Mexico, as Dr. Uhler records its occurrence in Panama and Trinidad, and Distant figures what he takes to be a black variety from Mexico. The form of this species is narrower and more convex above, and the pronotum is distinctly longer than in *bioculatus*. I have observed but little tendency to vary in this species.

Mineus strigipes H. S.

This insect bears quite a strong resemblance to *Perillus confluens* or a small specimen of *bioculatus* Fabr., but it can be readily distinguished by the unarmed anterior femora, a character separating this genus from *Perillus*. The color is deep blue-black, with the narrow anterior, latero-anterior margins and median longitudinal line, and the broad latero-posterior submargin of the pronotum, and a submarginal vitta on the scutellum forming a perfect V, of a fulvous or red. The narrow costal margin, the connexivum, and the body beneath are of the same fulvous red color, with the sutures of the pleuræ, a row of stigmatal spots, a narrow vitta on the base of the venter, a large subapical square spot bifed before, and the anal segment blue-black. The antennæ and legs are black, with the coxæ and femora beneath pale. Rostrum black, basal joint pale. The head is slenderly edged with pale before, sometimes the larger ventral spot is broken into about six smaller ones, and in one individual the red margin of the pronotum is continued around the base Dr. Uhler records this species from New York, Maryland, South Carolina, Georgia, Texas and New Mexico. It is included in the Gil-

lette and Baker List of the Hemiptera of Colorado, and in Smith's Catalogue of the Insects of New Jersey. For the specimens in my collection I am indebted to Prof. C. W. Johnson and Mr. de la Torre Bueno for material taken respectively in New Jersey and at Mosholu, N. Y. Prof. Osborn has more recently sent me specimens from Ohio and Washington, D. C., and I have seen others from Massachusetts.

Rhacognathus americanus Stal.

I have seen but four specimens of this species, all darker in color than the description by Stal would indicate. They are virtually black, but a close inspection shows the testaceous rugæ between the punctures. The specimen now in my collection was taken at Winnipeg, Manitoba, by Mr. Hanham. Prof. Osborn has two specimens taken at Londonville, Ohio, in June.

Zicrona cærulea Linn.

Uhler records this pretty species from Idaho, Arizona, New Mexico, Colorado and Utah; Prof. Cockerell has kindly given me a typical example taken in the Organ Mountains, New Mexico; and an example of the bronze variety described as *cuprea* by Dallas, taken at Salt Lake City, Utah, in July, 1899, was sent to me by Mr. G. Wesley Browning. Mrs. Slosson has taken it on Mt. Washington, New Hampshire.

Genus **PODISUS** H. S.

In the 45th Annual Report of the Massachusetts State Board of Agriculture, for 1897, pp. 412–439, Mr. A. H. Kirkland gives us a very full and careful account of this genus. I give below a more extended synopsis of the species to supplement that given by Mr. Kirkland. It includes one southern species (*sagitta* Fabr.) not included by him and restores *bracteatus* Fitch to the specific rank I believe it should have.

Cheeks longer than the tylus, at times approaching and subcontiguous before it, its inner angle acute; size large.....1.

Apex of the head truncated; cheeks and tylus equally long, or rounded with the tylus exceeding the cheeks.....3.

1. Humeri rounded, not at all prominent; posterior angles of the pronotum produced in a short acute spine (*Apateticus*).....**Gilletti.**

Humeri prominent, obtuse or acute (*Apœcilus*).....2.

2. Median valve of the female genital segment quadrangular.....**cynicus.**

Median valve of the female genital segment triangular.

bracteatus and **crocatus.**

3. Apex of the head rounded, tylus slightly exceeding the cheeks, humeri acutely spinose, basal angles of the scutellum with a large calloused spot (*Tylospilus*) ..... **acutissimus.**

Apex of the head truncated, cheeks as long as the tylus, outer angles rounded, inner subacute (*Podisus*) ..... 4.

4. Humeri acutely spinose, directed forward ; latero-antero margins and two discal dots of the pronotum, and the apex of the scutellum distinctly calloused and white ..... **mucronatus.**

Humeri obtuse or acute, directed outward ; latero-anterior margins of the pronotum and apex of the scutellum not conspicuously calloused. 5.

5. Humeri obtuse, almost rounded ; form oblong, broader posteriorly than is usual in this genus; venter normally with two rows of black points each side ; membrane without a distinct vitta..... **placidus.**

Humeri acute or spinose ; membrane with a longitudinal dusky vitta.....6.

6. Humeri distinctly but not deeply emarginate a little before the tip...**sagitta.**

Humeri entire, acute or spinose.....7.

7. Smaller (7 to 8 mm.); humeri less acute; legs immaculate; ventral spine short, not reaching to the hind coxæ..... **modestus.**

Longer (8 to 10 mm.); humeri more acute or spinose.....8.

8. Color dark, quite strongly tinged with rufous, especially on the legs and antennæ ; the femora darker toward their apex and sometimes with an obscure darker subapical annulus; median row of black spots on the venter grading larger posteriorly ; ventral spine very short. **sereiventris.**

Color more gray or brown ; legs with two black points near the apex of the femora ; median row of black spots on the venter small with the posterior one much larger; ventral spine long..... **maculiventris.**

Podisus (Apateticus) Gilletti Uhler. Gillette and Baker's Hemiptera of Colorado, p. 12, 1895.

So far as I can make out this insect corresponds in every particular with Stal's description of *marginiventris* (Enum. Hemipt., 1, p. 49 ; Distant, Biologia, pl. 4, fig. 24), and I have little doubt but a comparison with Stal's type would show their identity. I place this species in *Apateticus*, although it does not altogether agree with the characters given by Dallas. The posterior angles of the pronotum are armed with a short and very acute spine, a character noticed by Stal, but overlooked by Uhler. This species strongly resembles *Jalla dumosa* of Europe, but may be separated at once by the unarmed anterior femora. Genus *Jalla* has a stout femoral tooth.

I took two females of this rare species at Horse Tooth Gulch near Ft. Collins, Colorado, in July, 1900, and Dr. Uhler's type, which I have examined, came from the same locality. So far as I know these are the only known specimens of this species, unless we add Stal's type of *marginiventris* which was from Mexico, and another mentioned by Dr. Distant.

Podisus (Apœcilus) cynicus Say. *Arma grandis* Dallas.

In the Lethierry and Severin Catalogue *cynicus* and *grandis* are given as distinct species, but their descriptions evidently refer to the same insect. This is a common species throughout the eastern United States and Canada, and I have seen specimens from as far west as Galveston, Texas. This is, I think, the largest Pentatomid found in the eastern United States. I have seen specimens taken about Buffalo that measured 20 mm. in length.

Podisus (Apœcilus) bracteatus Fitch.

Described from New York. I have seen specimens taken in Montreal (Beaulieu); Idaho (Aldrich); and Vancouver Island (Taylor). It is distinctly a northern species, and in this form at least does not extend south of New York. One of the Vancouver Island specimens is the darkest I have seen; the pronotum and scutellum being of an almost uniform deep metallic green, with a few scattering pale areas, and the elytra are mottled with metallic green and dusky ferruginous. This species averages a little smaller than *cynicus;* the humeri are more abrupt and less acute, and the latero-anterior margins of the pronotum are more strongly crenulated. *P. bracteatus* and the form mentioned below as *crocatus* may always be distinguished from *cynicus* by having the median valve between the basal plates in the female genital segment triangular. In *cynicus* it is quadrangular. The Lethierry and Severin Catalogue erroneously gives 1859 as the date of this species, it should have been 1856. I cannot agree with Mr. Kirkland in placing it as a synonym of *cynicus.*

Podisus crocatus Uhler. Trans. Md. Acad. Sciences, i, p. 384, 1897.

A pale form that I cannot distinguish, except in color, from *bracteatus* is common throughout Colorado, Utah, Arizona and the adjoining portions of the Rocky Mountains, and has been taken in Manitoba by Mr. Hanham. I have seen specimens of this in at least two collections that were determined by Dr. Uhler, as his *crocatus,* although it does not correspond as well with his description as does the preceding form which I have called *bracteatus* Fitch. I am forced to the conclusion that this is the paler southern form of that species, although I do not care to merge them until they have had more thorough study and with fuller material than is now available.

Podisus maculiventris Say. Desc. of new species of N. Am. Insects found in Louisiana by Joseph Barabino, p. 11, 1831. Reprint in Psyche, viii, p. 307, 1899.

This is the insect long known as *Podisus spinosus* Dallas. We are indebted to Dr. Scudder for the re publication of the rare paper by Say in which his description first appeared. It is a common predacious insect over a great part of the United States and Canada, but becomes less abundant west of the eastern slopes of the Rocky Mountains. Dr. Uhler's western records include California, Colorado and Texas; Prof. Osborn adds Arizona, and I have seen specimens from Montana (Cooley), Manitoba (Hanham), and Vancouver Island (Taylor).

Podisus sereiventris Uhler.

This species is very close to *maculiventris*. The few specimens I have seen have all been smaller, more reddish in color, and have the humeri less acute and produced. I possess specimens from Vancouver Island (Taylor), and Kalispell, Montana (Wickham), and Mrs. Slosson has taken it at Franconia, New Hampshire. Mr. Kirkland reports this as "by far the most common representative of the genus" in Massachusetts, but his description seems to refer to the form given here as *maculiventris*. A study of the type is greatly needed.

Podisus modestus Dallas.

Common throughout the northeastern United States and Canada and extends westward to Manitoba (Hanham), Dakota, Nebraska, Colorado, Montana (Cooley), Vancouver Island (Taylor) and Mexico. The small size, pale colors and short ventral spine will distinguish this species from *maculiventris*. I would differentiate it from *sereiventris* by its smaller size, narrow and more depressed form, paler colors and the shorter second joint of the antennæ. Kirkland adds the shorter ventral spine, but as I identify *sereiventris* this spine is even shorter than in *modestus*.

Podisus placidus Uhler. Am. Ent., ii, p. 203, 1870; Can. Ent., xxix, p. 115, 1897.

Omitted from the Lethierry and Severin Catalogue. An interesting and distinct species that has been recorded from Canada, Massachusetts, New York, Michigan and Colorado by Kirkland, and from Iowa by Osborn. The rounded humeri, rectilinear latero-anterior margins of the pronotum, immaculate membrane, and long

ventral spine will distinguish this species. The sides of the head are narrowly black in all the specimens I have examined.

Podisus sagitta Fabr.

A Mexican and West Indian form that has been reported by Dr. Uhler from Texas. A fairly good figure is given by Distant in the Biologia, pl. 1, fig. 22. The imperfectly emarginated humeri will distinguish this species from *maculiventris*, its nearest relative in our northern fauna.

* **Podisus pallens** Stal.

I have seen one specimen, undoubtedly *pallens*, in the collection of Prof. Herbert Osborn. It is certainly very close to *maculiventris* and *modestus*, but without material for study I cannot attempt to place it in my synoptical key. Stal's types were from California, and Dr. Uhler has recently recorded it from Lower California.

Podisus mucronatus Uhler. Trans. Md. Acad. Sciences, i, p. 386, 1897.

Mrs. Annie Trumbull Slosson has generously given me an example of this distinct species taken in southern Florida, and the types were from the same source. It cannot be confounded with any other species known to me.

Podisus acutissimus Stal.

Of this very pretty species I possess four examples from Texas. Two of these were taken at Brownsville by Prof. Wickham. All of my specimens have the median callous on the base of the scutellum, as pictured by Distant in the Biologia, pl. 2, fig. 22. Dr. Uhler reports this species from Colorado, and the types were from Texas and Mexico.

Mutycha phymatophora P. B Indian.

This is a large West Indian form that has been taken in southern Florida by Mrs. Slosson, Distant considers it as distinct from the South American *grandis*, and it is so listed in Lèthierry and Severin's Catalogue.

Mutycha grandis Dallas.

Mr. Otto Heidemann has an example of this species that was taken in southern Florida. Distant distinguishes it from the preceding by its having the humeral spines directed somewhat forwards and in having the base of the scutellum and the elytra more closely punctured. In the few specimens I have examined of this species

the ventral spine is longer, the apical angles of the sixth ventral segment are more strongly produced and the colors are paler than in *phymatophora*.

Euthyrhynchus floridanus Linn.

Amyot and Serville report this species from Philadelphia, Stal from New Orleans, and Prof. Ball has sent me an individual taken at Dayton, Tennesee. It is more abundant toward the south, and in Costa Rica and other tropical countries takes on its most brilliant coloring of metallic green or blue and orange.

Subfamily ACANTHOSOMIDÆ.

This subfamily is well distinguished from our other Pentatomids by the biarticulate tarsi and the sharply keeled sternum. But one genus has as yet been reported from our territory.

Genus **ACANTHOSOMA** Curtis.

Greenish testaceous; elytra with a transverse band near the middle and the apical margin clouded with brown. Size small ..... **lateralis.**

Pale or yellowish testaceous; inner and apical margins of the elytra sanguineous or brown ..... 2.

2. Antennæ pale, apical joint dusky; pronotum with large, scattering, fuscous punctures ..... **cruciata.**

Antennæ piceous or black; punctures on the pronotum concolorous nearly to the hind margin ..... **atricornis.**

Acanthosoma lateralis Say.

Edessa nebulosa Kirby. Fauna Bor. Am., Insects, p. 277, 1837.
Acanthosoma affinis Westw. Hope Catal., i, p 30, 1837.
Acanthosoma picicolor Westw. Hope Catal., i, p. 30, 1837.

For the Westwood synonomy given here I am indebted to Distant's Studies on the Hope Collection. This is a widely distributed species in the northern United States and Canada, and Distant even reports a specimen from Mexico, the only references he gives for Mexico, however, are referable to one example in the collection of Dr. Signoret, and it is more than likely that there may have been an error in the locality from which it came. My material is from Montreal, New York and Vancouver Island, the latter kindly sent to me by Rev. G. W. Taylor.

Acanthosoma cruciata Say. (*Acanthosoma borealis* Westw. Distant, Proc. Zool. Soc., 1890, p. 818.)

This species is of a pale testaceous yellow, with the apex of the

antennæ and tarsi darker. The hind edge of the pronotum, the inner and apical margins of the elytra, and the apex of the abdomen are sanguineous. The whole upper surface is dotted with large blackish punctures which become almost concolorous and distant on the outer disk of the elytra. It seems to be distributed across the whole northern part of the continent. I have seen specimens from New York, North Carolina, Montreal (Cooley), Utah (Browning), and Vancouver Island (Taylor).

Acanthosoma cruciata Say, var. **Cooleyi** n. var.

Closely allied to the European *dentata*. Pale yellowish testaceous tinged with green on the posterior disk of the pronotum; humeral angles and latero-posterior margins of the pronotum, a triangular indefinite spot covering most of the base of the scutellum, broad inner margin of the corium connecting with a large spot at the outer apical angle, and the apex of the abdomen, reddish or sanguineous. Head with a very few large punctures, which are blackish on its disk becoming concolorous apically; sutures at the base of the tylus brown; tips of the cheeks attaining the apex of the tylus on either side, but slightly exceeded by its rounded end. Antennæ pale or almost rufous, fourth joint a little dusky, the fifth fuscous beyond the middle. Pronotum a little longer than in *dentata*, marked with a few large, scattering, black punctures, which omit the callosities and form an arcuated line on the anterior submargin. Punctures on the scutellum large and scattering, the narrow excavated tip smooth. Elytra more closely punctured near the inner and apical margins, these punctures but little darker than the adjacent surface. Membrane very slightly embrowned toward the base and outer angles. Beneath pale yellowish, immaculate, with large uncolored punctures on the posterior half of the propleura. Legs pale, tarsi and apex of the tibiæ dusky. Genital segment of the male rounded behind where there is a broad, shallow sinus extending for half its width, mostly filled with a close-set brush of stiff bristles so arranged as to form a triangular median notch. In *dentata* this sinus is indicated only by a small black tooth on either side. Length 7-8 mm.

Described from one male and two female examples collected at Bozeman, Montana, by Prof. R. A. Cooley. I have also examined specimens, hardly separable, from New York and Canada. These with further material from Prof. Cooley show connecting links with *cruciata* that lead me to consider this as but a variety of that species.

Acanthosoma cruciata Say is a larger insect (10 mm. long), with a broader and shorter pronotum, more sinuated on its latero-posterior margin; the tylus is a little longer, the sternal lamina is more elevated between the anterior coxæ, and the intermediate lateral plates of the female genital segment are shorter and almost rounded behind. In my variety (*Cooleyi*) these plates, lying between the valve and the outer plates, are extended at the inner apical angle almost or quite to the apical margin of the outer plates and are sub-

acute. *Acanthosoma dentata* of Europe is closely related to *cruciata*. It has the same form of female genital pieces, but the apical angle of the sixth abdominal segment is more acute, the sternal lamina is less elevated, and the punctuation above is finer and closer, especially on the elytra and scutellum. Further observation and material may show *cooleyi* to be a distinct species.

Acanthosoma atricornis n. sp.

Size and form of *cruciata* nearly. Head pale, shorter and broader than in our other species; the tylus hardly longer than the cheeks, which are a little thickened on the edges; disk with a few almost obsolete uncolored punctures. Eyes black, ocelli red. Antennæ shining black becoming fuscous toward the apex, the nodes touched with pale. Pronotum pale, the punctures shallow and concolorous, inconspicuous; humeral angles rather prominent, subacute, shining piceous black, shading into sanguineous on the base of the elytra and along the latero-posterior and hind margins of the pronotum. Scutellum faintly reddish on the base and tip, paler across the middle, the punctures scattering, dark brown or black. Elytra pale, dull sanguineous along the inner and apical margins or deepened to piceous on the shoulder and rounded apical angle, costa narrowly pale at base. Membrane with a brown cloud at base and a well-defined fuscous spot over the dark apical angles of the last abdominal segment. Beneath pale becoming fulvous on the venter and deepening to sanguineous toward the tip and to black on the acute apical angles of the sixth segment. Stigmata brown, transverse. Sternal lamina much elevated between the anterior coxæ, as in *cruciata*. Legs pale, the apex of the tibiæ and tarsi dusky. Valve of the female genital segment more triangular than in *cruciata*, the intermediate plates short and obtuse, as in that species. Apex of the male genital segment feebly rounded, the sinus almost obsolete, the apical bristles short, forming but a small brush either side of the middle. Length 9 to 10 mm., width across the humeri 5 to 5½ mm.

Described from many examples taken in Montreal by Mr. Germain Beaulieu, and two taken in Indiana by Prof. W. S. Blatchley. There are also specimens in the Cornell University collection taken in New York. So far as my observations extend this seems to be our most abundant northern species of *Acanthosoma*. I formerly determined it as *cruciata* Say, but the black antennæ and humeral angles, and uncolored punctures on the pronotum will at once distinguish it from that species as well as from the European *dentata*. It is apparently the insect described by Provancher as *cruciata* Say (Petite Faune Ent. du Canada, Hemip., p. 48), but from his notes he had evidently seen the true *cruciata* without recognizing it as distinct.

ADDITIONS.

During the printing of this paper I have received material from Mr. Samuel Henshaw, Mr. Otto Heidemann and Mr. Harry G. Barber that adds something to the facts therein recorded and brings the total number of species and distinct varieties here listed up to 204. This includes a few additions incorporated with the body of the paper while it was going through the press. Further research will doubtless materially increase this number.

***Corimelæna minuta** Uhler.

Mr. Heidemann has sent me an example of this species that was taken at Jacksonville, Florida. It was described from Cuba. This tiny little insect closely resembles *pulicaria*, but is only about half the size of that species, and has the pale border of the corium narrow and of equal width throughout, not widened inwardly at base.

Homœmus consors Uhler.

An insect determined as this species by Dr. Uhler was sent to me by Mr. Henshaw. It answers in every particular to Dr. Uhler's description of *consors*, but I have been unable to detect any character to distinguish it from his earlier species—*bijugis*. Prof. Osborn writes me that he has come to the same conclusion as to the identity of these species.

Aulacosthethus simulans Uhler.

Mr. Henshaw's material contained an example determined by Dr. Uhler as this species. It seems to me to be but a clearly marked example of *marmoratus* Say. I have found these clearly marked specimens in all the material of this species that I have examined. They have in all cases been females, and so far as I can see this seems to be the pattern characteristic of that sex of *marmoratus*. Western material in this case, as in many of the allied species, is more clearly marked than is the eastern.

Camirus consocius Uhler.

Two examples of this species are in the Heidemann collection. They are a little larger than *porosus*, with the surface, perhaps, more coarsely punctured, and the scutellum marked with fulvous on the apex, on the median line before the apex, and near the base on either side. They are from Edingburg, Texas.

* **Acantholoma denticulata** Stal.

Mr. Heidemann has an example of this species that was taken in Kansas—the first I have seen. It closely resembles *Camirus porosus* Germ., but the pronotum is broader before, with its edge and the margins of the head inferiorly minutely denticulate.

* **Podops dubius** P. B.

Mr. Heideman has sent me a pair determined as this species that were taken at Fortress Monroe, Virginia. After a careful study of these specimens I feel, no doubt, but that the determination is correct, at least as the species is identified by Stal. The following note may assist in locating it in the future:

Larger than *cinctipes* Say. Length, male, 7 mm.; female 9 mm. Head about as in *cinctipes*, the tylus more tumid and prominent for its whole length. Second joint of the antennæ obviously longer than the third, the incisure distinct. Pronotum shaped as in *cinctipes*, the tooth at the anterior angle more prominent, directed outward and a very little forward. Scutellum *in the female* proportionately broader and shorter than in *cinctipes*. Punctures becoming obsolete and distant along the middle line of the venter, as in *cinctipes;* the sixth ventral segment strongly and almost acutely produced anteriorly, as in *parvulus*. The genital characters of the male are about those of *cinctipes*, but the depressed apical smoothish area of the genital segment is broader and rounded anteriorly, not subproduced and encroaching upon the punctured basal area as in *cinctipes*, and the apical angles are even more strongly produced than in *cinctipes*, with their tips pale. In the female the apex of the genital segment is distinctly emarginate, and the apical margin of the sixth ventral segment is feebly produced at the middle, a character quite obvious in some examples of *cinctipes*. This pair is paler in color than is usual in the allied species, and the pale colors on the breast and legs are correspondingly more extended. The form of the scutellum does not differ in the two sexes in our other two species, and it is quite possible that this difference is not constant in *dubius*.

Euschistus biformis Stal.

Mr. Harry G. Barber of New York City has a specimen of this species that was taken in Arizona. This is its first recorded occurrence within our territory.

Eysarcoris punctiger Walker.

Described from California. Unrecognized by recent students.

Padæus irroratus H. S.

Mr. Barber has added this species also to our fauna. He has a specimen taken in Florida.

Genus **BREPHOLOXA** n. gen.

Aspect of a small *Loxa*, but more closely allied to *Liotropis* Uhler. Head long, triangular; cheeks longer than the tylus and nearly or quite contiguous before its apex, the sides nearly rectilinear, scarcely sinuated before the eyes; surface flat, edge carinated. Antennæ short, basal joint not reaching the apex of the head, second longest, third, fourth and fifth a little shorter, subequal. Buculæ percurrent, but slightly elevated, forming a prominent tooth near the base of the rostrum. Rostrum reaching to the hind coxæ, first joint scarcely attaining the base of the head, second longest, fourth shortest. Pronotum rather short, humeri prominent, latero-anterior margins crenulated. Scutellum triangular, the frenum extending somewhat beyond the middle. Apical angles of the abdominal segments scarcely prominent; base of the venter with a short acute spine that reaches between the hind coxæ. Femora unarmed. Osteolar canal short, truncated. Sternum ecarinate.

This genus may be distinguished from *Loxa*, *Chlorocoris* and their allies by the ventral spine, and from *Ægius*, with which it would fall in Stal's synopsis, by the different length of the antennal joints, shorter rostrum, longer ventral spine, form of the abdomen, smooth margins of the venter, and especially by wanting the elytral dilatation. Superficially this genus bears a strong resemblance to *Thyanta*. It is still nearer to *Liotropis* Uhler, but differs in its more elongated form and the shorter truncated osteolar canal. It corresponds very closely with *Liotropis* in the form of the head and pronotum and in the presence of a ventral spine. I would arrange it immediately before that genus.

Brepholoxa Heidemanni n. sp.

Uniform pale testaceous yellow, closely and evenly set with concolorous punctures. Apex of the antennæ and rostrum, margins, both above and below, of the head and of the pronotum as far as the humeri, tinged with rufous, these margins more or less edged with blackish for a little space before and behind the eyes. Tarsi sometimes tinged with rufous. Tergum concolorous, impunctate. Humeri subacute. Wings hyaline. Apex of the scutellum produced, narrow, the tip subacute. The elytral costa is very feebly angled about one-third of the length from its base. Sixth ventral segment roundedly produced anteriorly on

the middle, the hind margin deeply excavated in the male for the reception of the genital segment, the apical angles incurved, subacute. Male genital segment narrow produced at apex with a deep narrow median notch. The exterior plates of the female genital segment surpass the median plates and approach before them.

Described from one female and two male examples kindly sent me for description by Mr. Otto Heidemann, to whom I take pleasure in dedicating them. They are from Biscayne, Florida, and bear a label "*Chlorocoris loxops* Uhler MS.

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ERRATA.

Page 19, line 21, for Generales *read* General.
" 23, " 12, " Wood's Hole *read* Woods Holl.
" 25, " 10, " **Geotomatus** *read* **Geotomus.**
" 62, " 2 from bottom, for Trans. Ind. *read* Trans. Md.
" 72, " 27, delete "Indian" after **Mutycha phymatophora** P. B.

THE SPECIES OF ODONTOPHOTOPSIS (HYMENOPTERA).

BY HENRY L. VIERECK.

Of all the Mutillidæ the nocturnal species are least known, because of their habits. Both sexes are on record of only one North American species. The males can be secured as readily as night flying moths, with the aid of a light; but the finding of the females has been more accidental than otherwise. While in the Upper Sonoran Zone of New Mexico, at Alamogordo, Otero County, the writer obtained many males, which used to fly into the room against the lamp, one or two at a time, until after midnight. Not one female was seen, though all likely places were examined.

Until the sexes of the species are known, our classifications of these insects can be temporary only; it is to be hoped that entomologists living where these insects make their homes, will endeavor to discover the missing sexes.

The species of the genus as those in the allied genera vary considerably in the structure and sculpture of the males, affording quite a number of characters for separating them. Some of the characters of the species described in the following pages are common to all. The clypeus is concave and polished. The first joint of the flagellum is three fourths the length of the second, a little more or less, the other joints subequal. There is a variable impression on each side of the pronotum, with usually a subtle appearance. The sculpture of the dorsum is always more separated medially than near the sides. The postscutellum usually has a sculpture like that on the scutellum, with a tendency to become rugulose. A longitudinal ridge bisects the area on the disc of the metathorax. The structure of the mesopleura is of a uniform character. Beyond the second the segments of the abdomen are finely sculptured. In color the species do not deviate very much from each other; the mandibles are invariably tipped with black or dark brown.

Recent studies have revealed structural characters previously not used in descriptions, of these the function is not known. A few explanations concerning some of the terms employed may not be super-

fluous. Area refers to the enclosure on the disc of the metathorax always present, though sometimes much abbreviated. Felt lines, mean the furrows or impressed lines, filled with appressed pubescence, thus >>>>. Subtle area is an enclosure on the second abdominal segment, sometimes hidden by the overlying first segment.

The species are rare in collections. During several weeks of lamp light collecting at Alamogordo, New Mexico, only one specimen was captured. Only one specimen is on record of *venustus*, *aulus*, *adonis*, *thamyras*, *mellicausa* and *clandestinus*. Unless otherwise stated, the specimens on record, in this paper, are to be found in the collection of the American Entomological Society and the Academy of Natural Sciences, Philadelphia. For the privilege of examining specimens in the United States National Museum collection, I am indebted to Dr. W. H. Ashmead.

Key to the Species.

Head bulged behind the eyes, quite quadrate; large species.....1.
Head more triangular, sloping behind the eyes.....3.

1. Process of mesosternum large, heavy, gradually fusing with the mesosternum, mandibles terminating in a flattened angled portion.
venustus (Blake).
Process of mesosternum a short sharp tooth or spur, mandibles not very distinctly flattened near the end, straight.....2.
2. First abdominal segment rather coarsely punctured and closely, legs dark.
tapajos (Blake).
First segment with small rather sparse punctures, legs light..**aulus** (Blake).
3. First segment slender, not very broad at apex, a distinct constriction between it and the next segment.....12.
First segment broad, very broad at apex, sessile, no distinct constriction...4.
4. Large species, with a pygidial area bounded by a sharp ridge; 15 mm.
adonis (Fox).
Pygidial area poorly defined or absent; 13 mm. long or less.....5.
5. Species 8 mm. and over, processes strong.....6.
Species 8 mm. and less, processes weak.....7.
6. Last segment with a poorly defined pygidial area, insect dark testaceous.
inconspicuus (Blake).
Last segment without a pygidial area; insect pale testaceous.
acmæus n. sp.
7. Processes formed by the mesosternum being produced into a more or less pronounced angle on each side of the media furrow, anteriorly the processes are nearly contiguous, species dark.....8.
Processes simply short, sharp teeth, species pale.....11.
8. Strongly punctured throughout.....**sarpedon** (Fox).
Moderately, rather sparsely punctured.....9.

9. Almost black ..... **thamyras** (Fox).
Castaneous ..... 10.
10. Processes very pronounced, second segment broad, legs dark.
subtenuis n. sp.
Processes not pronounced, second segment slender, legs pale.
trunculus n. sp.
11. Punctures of first two segments strong, abdomen broad..... **crucis** n. sp.
Punctures of first two segments weak, abdomen slender ... **alemon** (Fox).
12. First and second abdominal segments polished, impunctate... **sereus** n. sp.
First and second abdominal segments more or less, but always, distinctly punctured ..... 13.
13. Processes broad and blunt..... 14.
Processes short spurs..... 16.
14. Pubescence golden ..... **exogyrus** Viereck.
Pubescence white..... 15.
15. Second segment coarsely punctured, processes broadly truncate.
claudestinus Viereck.
Punctures on second segment small, widely separated, processes blunt.
alamonis n. sp.
16. Large, 9 mm. and over..... 17.
Smaller, 8 mm. and less..... 19.
17. Mandibles short, broad and heavy..... **mellicausa** (Blake).
Mandibles long and slender ..... 18.
18. Very dark castaneous ..... **avellanus** n. sp.
Pale testaceous ..... 18½.
18½. Space between ocelli black..... **concolor** (Cress.).
Space between ocelli concolorous with head ..... **brevicornis** Fox.
19. Dark castaneous..... 20.
Pale castaneous..... 21.
20. Wings strongly brown..... **fallax** n. sp.
Wings pale, faintly yellowish..... **indotatus** n. sp.
21. Antennæ pale yellowish ..... 22.
Antennæ dark ..... 23.
22. Abdomen slender, first submarginal cell narrow, about four times as long as high..... **territus** (Cockerell).
Abdomen broad, first submarginal cell broad, about twice as long as high.
augustus n. sp.
23. Legs dark..... **succineus** Viereck.
Legs pale ..... **delodontus** n. sp.

Odontophotopsis venustus Blake).

Photopsis venustus Blake, Tr. Am. Ent. Soc., xiii, 270, ♂, 1886.
Mutilla pretiosissima Dalla Torre, Cat. Hym., viii, 73, ♂, 1897.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Arizona.

Odontophotopsis tapajos (Blake).

Agama tapajos Blake, Tr. Am. Ent. Soc., iii, 262, ♂, 1871.
Agama astynax Blake, ibid, vii, 254, ♂, 1879.

Photopsis tapajos Blake, ibid, xiii, 269, ♂, 1886.
Photopsis astynax Blake, ibid, xiii, 272, ♂, 1887.
Mutilla tapajos Fox, ibid, xxv, 266, ♂, 1899.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. Two specimens.

Odontophotopsis aulus (Blake).

Agama aulus Blake, Tr. Am. Ent. Soc., iv, 75, ♂, 1872.
Photopsis aulus Blake, ibid, xiii, 270, ♂, 1886.
Mutilla aulus Fox, ibid, xxv, 266, ♂, 1889.

Type, Coll. Am. Ent. Soc., Phila. *Type locality*, Texas.

Odontophotopsis adonis (Fox).

Mutilla adonis Fox, Tr. Am. Ent. Soc., xxv, 265, ♂, 1899.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Las Cruces, New Mexico.

Odontophotopsis acmæus n. sp.

Length, ♂, 9 mm.—*Head.*—Polished, punctures sparse and fine, median impressed line on the front distinct in greater part. Distance between posterior ocelli about twice that between them and the anterior ocellus; distance between posterior ocelli equal to or a little less than that between them and nearest eye margin. Lower margin of the eyes almost contiguous with the insertion of the mandibles. Mandibles elbowed, slender beyond the bend, not deeply emarginate on the lower margin which is merely undulate, without a strong tooth.

Thorax.—Prothorax rugose. Punctures of dorsulum separated, almost contiguous; innermost furrows strong, lateral furrows faint, starting about one-third the distance from the anterior margin. Scutellum closely rugose; postscutellum indistinctly sculptured, rugulose. Propleura rugose, in part simply roughened; mesopleura with shallow punctures on depressed part, bulged part with shallow contiguous punctures, posterior border smooth and polished. Area not symmetrical, rather oblong. Meshes of the reticulation, on metathorax, large, the raised lines defining them, not strong. A short abcissa on the radial nervure the only trace of a second cubital cell outline, first submarginal cell like in *exogyrus*; second recurrent entirely, subdiscoidal almost, obliterated. Transverse median nervure originating a little beyond the basal nervure.

Abdomen.—Petiole with punctures not sharply defined, close together and shallow. Second segment very finely, sparsely punctured. Felt line about one-half length of segment, on ventral segment a little shorter. Subtle area hidden.

Color.—Pubescence white, dorsally tinted with yellowish. Tegument pale testaceous, between ocelli almost black, antennæ paler than the body, legs very much paler. Stigma testaceous, nervures very pale.

Type, Coll. U. S. Nat. Mus. Wash. *Type locality*, Arizona. Arizona (2304), two males.

Odontophotopsis inconspicuus (Blake).

Photopsis inconspicuus Blake, Tr. Am. Ent. Soc., xiii, 272, ♂, 1886.
Mutilla infelix Dalla Torre, Cat. Hym., viii, 50, ♂ 1897.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, California. California, two males, El Chinche, Lower California. September, 1893, (Eisen), one male.

Odontophotopsis subtenuis n. sp.

Length, ♂, 6.5 mm.—*Head* with punctures irregularly placed, strong, medium sized, rather close together, no distinct median impressed line. Distance between posterior ocelli about twice the distance between them and the anterior ocellus; distance between posterior ocelli distinctly less than that between them and nearest eye margin. Malar space distinct, about one-half mm. high. Mandibles narrow, gently curved, slightly emarginate, teeth weak.

Thorax.—Prothorax closely rugose. Punctures on dorsulum separated, not far from contiguous, furrows only present on posterior half. Scutellum shining, almost reticulate; postscutellum indistinctly sculptured, rugulose. Propleura almost punctured, rugose, hardly any smooth space. Impressed portion of mesopleura with closely arranged punctures on the superior half, on lower half smooth; bulged part not strongly so, with close shallow punctures, rugose in appearance. Disc of metathorax with a rather oblong, irregular area. Meshes of the reticulation of metathorax moderately large, not strongly outlined. Only an indistinct abcissa on radial and subdiscoidal nervure; first submarginal cell not much more than twice as long as high; transverse median nervure interstitial with basal nervure.

Abdomen.—Petiole with only a few very shallow punctures on a shining surface. Second segment with sparse small punctures; the felt line on dorsal segment more than one half length of the segment, the felt line on ventral segment about one-half the length of the dorsal line.

Color.—Pubescence white, that of the felt lines dark, grayish. Testaceous; antennæ and legs very much darkened, dull brownish; stigma dark brown, nervures paler.

Remarks:—One specimen has the transverse median nervure originating beyond the basal nervure.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. Texas, two males. Georgia, one ♂.

Odontophotopsis sarpedon (Fox).

Mutilla sarpedon Fox, Trans. Am. Ent. Soc., xxv, 267, ♂, 1899.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. Texas, eight males.

Odontophotopsis thamyras (Fox).

Mutilla thamyras Fox, Trans. Am. Ent. Soc., xxv, 267, ♂, 1899.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas.

Odontophotopsis truncatus n. sp.

Length, ♂, 6.5 mm.—*Head.*—Punctures strong, medium sized, close together on front, rather sparse beyond, no median line. Distance between posterior

ocelli less than twice the distance between them and anterior ocellus; distance between posterior ocelli equal to or a little greater than that between them and nearest eye margin. Malar space distinct, less than one-half mm. high. Mandibles narrow, gently curved, slightly emarginate, teeth not strong.

Thorax.—Prothorax shining, crudely punctured. Dorsulum with strong, almost contiguous punctures, grooves present only on posterior half. Scutellum rugose; postscutellum indistinctly sculptured, rugulose. Propleura with a large shining area, shining rugulose; bulged portion not strong, closely reticulate or nearly, depressed part smooth and shining. Area not sharply defined, oblong. Meshes of the reticulation on metathorax large, not strong nor regular.

Wings.—Trace of a third transverse cubitus, with a trace of a nervure at right angles to it; second recurrent nervures absent, subdiscoidal nervure delicate. First submarginal cell four times as long as high. Transverse median nervure interstitial with basal nervure.

Abdomen.—Petiole with only a few very shallow punctures on a shining surface. Punctures on second segment sparse and small, felt line about one-half length of segment, on ventral segment a little shorter. Exposed part of subtle area semicircular.

Color.—Pubescence white, that of the felt lines dark. Pale castaneous, a spot on each side of pronotum and between ocelli black, antennæ and legs testaceous. Stigma and nervures darkened testaceous.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. Texas.

Odontophotopsis crucis n. sp.

Length, ♂, 7 mm.—*Head.*—Medium, strong uniform punctures, well separated, median line partly formed on front. Distance between posterior ocelli less than twice the distance between them and anterior ocellus; distance between posterior ocelli about equal to that between them and nearest eye margin. No malar space. Mandibles broadly emarginate, tooth short and rounded, elbow distinct.

Thorax.—Prothorax closely rugose. Punctures of dorsulum quite separated, grooves starting anterior to the middle. Scutellum coarsely punctured. Postscutellum indistinctly sculptured, rugulose. Propleura coarsely sculptured, rugulose. Propleura coarsely sculptured, almost reticulate, no smooth area. Mesopleura with bulged part pronounced, reticulated; depressed portion punctured and smooth in part. Area poorly defined, almost obsolete. Meshes of reticulation on metathorax large, strong.

Wings.—A very faint third transverse cubitus, second recurrent nervure entirely obliterated, subdiscoidal nervure indistinct. First submarginal cell four times as long as high. Transverse median nervure interstitial with basal nervure.

Abdomen.—Punctures of petiole sparse and shallow. Second segment with fine sparse punctures, felt line about one-half length of segment, on ventral segment a little shorter. Subtle area hidden.

Color.—Nearly all pubescence white. Testaceous; antennæ and legs pale, black spot between ocelli, abdomen darker than the rest of the insect. Stigma testaceous, nervures pale.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Las Cruces, N. M. Las Cruces, July 8th (T. D. A. Cockerell).

Odontophotopsis sereus n. sp.

Length, ♂, 12 mm.—*Head.*—Punctures distinct, sparse, closer on front than beyond, the median furrow represented by a pit. Distance between posterior ocelli a little less than twice that between them and anterior ocellus, equal to or a little less than that between the lateral ocellus and nearest eye margin. No malar space. Mandibles heavy, emargination a sharp incision, tooth strong and distinct.

Thorax.—Prothorax closely, rather coarsely rugose. Dorsulum with very coarse contiguous and almost contiguous punctures, furrows starting on anterior third. Scutellum and postscutellum very coarsely punctured. Propleura closely rugose, almost punctate, hardly any smooth area. Mesopleura with bulged portion prominent, punctured, the punctures not sharply defined, but rather large and close together, all of the depressed portion punctured. Area sharply defined, elliptical. Meshes of reticulation on metathorax very sharply defined.

Wings.—Third transverse cubitus and second recurrent nervure absent, subdiscoidal nervure faint, first submarginal cell nearly four times as long as high. Transverse median nervure interstitial with basal nervure.

Abdomen.—Petiole highly polished, punctures sparse and very minute. Second segment highly polished, punctures sparse and minute, felt line on dorsal segment as usual, not a trace on ventral segment.

Color.—Pubescence yellowish, except on metathorax and petiole where it is white. Bright castaneous; antennæ and legs pale testaceous. Stigma testaceous, nervures pale. Black between ocelli.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Lower California. Lower California, one specimen.

Odontophotopsis exogyrus Vier., Proc. Acad. Nat. Sci. Phila., 1902, p. 738, ♂.

Type, Coll. Acad. Nat. Sci. Phila *Type locality*, La Jolla, California. Two males, August, 1901 (T. D. A. Cockerell).

Odontophotopsis clandestinus Vier.—Proc. Acad. Nat. Sci., Phila., p. 740, ♂, 1902.

Type, Coll. Acad. Nat. Sci. Phila. *Type locality*, Mesilla, New Mexico. One male at light, July 31st (T. D. A. Cockerell),

Odontophotopsis alamonis n. sp.

Length, ♂, 12 mm.—*Head.*—Punctures sparse and shallow, no distinct median line. Distance between posterior ocelli equal to twice the distance between anterior and posterior ocellus. Distance between posterior ocelli greater than that between them and nearest eye margin. Malar space less than one-half mm. high. Mandibles like in *exogyrus*—the terminal portion broader.

Thorax.—Prothorax with rugosities, almost reticulate. Punctures of dorsulum strong, irregularly separated grooves starting on anterior third or nearly. Scutellum and postscutellum dull, rugose. Propleura rugose, a long narrow smooth area near posterior border. Mesopleura with the bulged portion rather prominent and coarsely reticulated. Depressed part smooth and polished, punctured

in part. Area almost quadrate, sharply defined in part. Meshes of reticulation on metathorax large, sharply defined. Wings—first submarginal cell little more than twice as long as high, otherwise like *sercus*. Transverse median nervure interstitial with basal nervure.

Abdomen.—Punctures coarse and close together. Second segment dull, punctures small, not far apart, in felt lines like *sercus*, subtle area broad at base, pointed at apex.

Color.—Pale castaneous, antennæ and greater part of legs pale testaceous. Spot between ocelli, a lateral streak on second abdominal dorsal and ventral segments and part of four posterior femora black or blackish. Stigma almost black, nervures very pale testaceous. Pubescence nearly entirely white.

Type, Coll. Acad. Nat. Sci. Phila. *Type locality*, Alamogordo, New Mexico. One ♂, Alamogordo, May 15, 1902. Expedition of Academy of Natural Sciences, 1902.

Odontophotopsis mellicausa (Blake).

Agama mellicausa Bl., Tr. Am. Ent. Soc. Phila., iii, 240, ♂, 1871.
Photopsis melicausa Bl., ibid., xiii, 262, ♂, 1886.
Mutilla mellicausa Fox, ibid., xxv, 255, ♂, 1889.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas.

Odontophotopsis avellanus n. sp.

Length, ♂, 13 mm.—*Head.*—Punctures very distinct, contiguous and almost contiguous on front, well separated beyond, median impression rather shallow. Posterior ocelli with a distance between them which is twice as great as that between them and anterior ocellus, and a little greater than that between them and nearest eye margin. No malar space. Mandibles elbowed almost to a L, the terminal portion very slender and narrow, emargination distinct, but not deep, tooth an acute angle.

Thorax.—Sculpture of prothorax closely rugose. Dorsulum with strong punctures, nearly contiguous, grooves strong, starting on anterior third. Scutellum punctured, punctures contiguous. Postscutellum indistinctly sculptured, rugulose. Propleura closely rugose, almost punctured, apparently no smooth area. Bulged portion of mesopleura distinct, covered with shallow punctures close together, depression punctured. Only a remnant of an area at base of metanotum. Meshes of the reticulation on metathorax large, very sharply defined. Wings—a very faint third transverse cubitus, otherwise like *sercus*. Transverse median nervure interstitial with basal nervure.

Abdomen.—Petiole much like in *alamonis*. Punctures of second segment small and separated, numerous; felt lines as usual, on ventral segment reduced almost to a spot. Subtle area large, semicircular in outline.

Color.—Dull castaneous. Antennæ darkened, brownish, legs pale testaceous. Stigma testaceous, nervures pale testaceous. Pubescence nearly white, felt line dark.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. One ♂, Texas.

Odontophotopsis concolor (Cress.).

Mutilla concolor Cress., Proc. Ent Soc. Phila., iv, 439, ♂. 1865.
Agama concolor Blake, Tr. Am. Ent. Soc. Phila., iii, 262, ♂, 1871.
Photopsis concolor Blake, ibid., xiii, 265, ♂, 1886.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Colorado. Two males, Colorado. One male, Las Cruces, New Mexico, July 8th (Cockerell). One male, Lewiston, Idaho.

Odontophotopsis brevicornis (Fox).

Mutilla brevicornis Fox, Tr. Am. Ent. Soc. Phila., xxv, p. 255, ♂, 1889.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. Four males, Texas. One male, Montana. One male, Fort Grant, Ariz., July 16th (H. G. Hubbard). Coll. U. S. N. M.

Odontophotopsis fallax n. sp.

Length, ♂, 9 mm.—*Head.*—Punctures well separated, rather uniformly placed, good sized and shallow, shallow median impression; paratype with a pit. Posterior ocelli with a distance between them which is less than twice the distance between them and anterior ocellus, and distinctly less than that between them and nearest eye margin. Hardly any malar space. Mandibles strongly elbowed, emargination deep, angle strong.

Thorax.—Prothorax rugose, nearly like in *trunculus*. Dorsulum with distinct irregular separated punctures, parapsidal grooves extending to anterior margin. Lateral groove one-half length of parapsidal groove. Scutellum and postscutel with punctures close together. Propleura widely rugose, sculpture irregular, hardly any smooth space. Bulged portion of mesopleura sharply defined by a polished groove, with shallow punctures close together, depressed portion punctured in greater part, inferiorly smooth and shining. Area of metathorax almost oblong, poorly defined. Meshes of metathorax rather irregular, not sharply defined. Wings—first submarginal cell about three times as long as high. Trace of a third transverse cubitus, subdiscoidal nervure strong, but no trace of a recurrent nervure on it. Transverse median nervure interstitial with basal nervure.

Abdomen.—Petiole similar to *alamonis*. Second segment polished, punctures small and sparse, felt lines on dorsal segments as usual, on ventral segment about one-half as long as on dorsal segment. Subtle area hidden.

Color.—Castaneous, antennæ darkened brownish, legs a little paler than body. Stigma dark brown, nervures a shade paler. Pubescence yellowish.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Nevada. Two males from Nevada. Paratype 7 mm. in length.

Odontophotopsis indotatus n. sp.

Length, ♂, 10 mm.—*Head.*—Punctures strong, contignous or nearly on front, well separated beyond, median depression a pit. Distance between posterior ocelli a little less than twice the distance between them and anterior ocellus, a little greater than that between them and nearest eye margin. No malar space. Mandibles similar to *fallax*.

Thorax.—Prothorax closely rugose. Dorsulum with punctures uniform in size, deep and irregularly separated, parapsidal groove originating somewhat anterior to middle, lateral groove more posterior. Punctures on scutellum and postscutel irregular and close together. Propleura closely rugose or rugulose. Mesopleura with bulged portion distinctly covered with contiguous rather large shallow punctures, shallow portion smooth and shining, sparsely punctured. Area abbreviated, apparent only at base. Meshes of reticulation on metathorax large, sharply defined, shallow. Wings—first submarginal cell as in *fallax*, subdiscoidal nervure distinct, but no trace of an abcissa on it, nor on the radius, where the third transverse cubitus should be. Transverse median nervure originating beyond the basal nervure.

Abdomen.—Punctures of petiole not coarse, sparse. Second segment polished, punctures numerous, small and well separated, felt line as usual, on ventral segment merely a dot.

Color.—Dull castaneous, antennæ and four posterior legs blackish. Stigma dark brown, nervures pale testaceous. Pubescence on metathorax, petiole and second segment white, otherwise faintly yellowish.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Texas. One male from Texas.

Odontophotopsis territus (Ckll.).

Photopsis territus Ckll., Ent. News, v, 200, ♂, 1894.

Mutilla territus Fox, Trans. Am. Ent. Soc. Phila., xxv, 255, ♂, 1899.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Las Cruces, New Mexico. Two males, Las Cruces (Wooton). One male, Las Cruces, August (Cockerell).

Odontophotopsis augustus n. sp.

Length, ♂, 7 mm.—*Head.*—Punctures obscure, median depression a pit. Distance between posterior ocelli about equal to twice the distance between them and anterior ocellus and a little greater than that between them and nearest eye margin. No malar space. Mandibles gently curved, excised, the tooth a blunt short angle.

Thorax.—Prothorax rather coarsely rugose. Punctures of dorsulum sparse and small, parapsidal groove slight, originating anterior to middle. Lateral groove indistinct. Scutellum and postscutel rugose, almost rugulose, dull. Propleura almost reticulate, large part roughened. Mesopleura with bulged portion not very distinct, with a close reticulation continued on the depressed portion above, the depressed part being smooth and shining inferiorly. Area not sharply defined, almost quadrate. Meshes moderately large, sharply defined Wings—first submarginal cell more than twice as long as high, but not three times, subdiscoidal nervure very faint, no abcissa on it nor on the radius. Transverse median nervure interstitial with the basal.

Abdomen.—Punctures on petiole coarse and closely arranged. Punctures on second segment sparse and very small, felt line as usual, on ventral segment one-half as long as on dorsal segment. Subtle area tapering like the end of a finger.

Color.—Testaceous, antennæ and legs very pale testaceous, black spot between ocelli. Stigma testaceous, nervures pale. Pubescence white.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, St. Augustine, New Mexico. One ♂ from St. Augustine, New Mexico (Cockerell 2126).

Odontophotopsis succinctus Vier., Proc. Acad. Nat. Sci. Phila., p. 741, ♀, 1902.

Type, Coll. Acad. Nat. Sci. Phila. *Type locality*, La Jolla, California. Two males taken in August at La Jolla (T. D. A. Cockerell).

Odontophotopsis delodontus n. sp.

Length. ♀, 8 mm.—*Head.*—Punctures numerous on front, with depression a shallow pit. Distance between posterior ocelli a little less than twice the distance between them and anterior ocellus, and a little less than that between them and nearest eye margin. No malar space. Mandibles gently curved, excised, the tooth a short blunt angle.

Thorax.—Prothorax closely rugose. Punctures on dorsulum strong, irregularly separated, parapsidal grooves arising about at middle, lateral grooves almost equal in length to parapsidal grooves. Scutellum and postscutel with irregular punctures, almost rugose. Propleura coarsely sculptured, rugose, in part smooth. Bulged portion of mesopleura rather distinct, closely punctured, depressed portion sparsely punctured. Area almost reduced to a remnant. Meshes of reticution on metathorax regular, sharply defined. Wing—first submarginal cell four times as long as high. Subdiscoidal cell distinct, otherwise like *indotatus*. Transverse median nervure interstitial with basal nervure.

Abdomen.—Petiole much like *indotatus*. Punctures numerous, small, well separated, felt line as usual, on ventral segment a dot, subtle area broad, semicircular.

Color.—Testaceous, antennæ and legs pale testaceous, not much black between ocelli. Stigma brown, nervures pale testaceous.

Type, Coll. Am. Ent. Soc. Phila. *Type locality*, Arizona. One male, Arizona.

NOTES AND ADDITIONS.

A study of that portion of Mr. Melander's "Notes on North American Mutillidæ, with Descriptions of New Species," which relates to the genus *Odontophotopsis*, revealed the following additional species—all males:

hebes, New Mexico.
cockerelli, W. Texas.
simpliciventris, Texas.
wheeleri, Austin, Texas.
grata, La Cueva, Organ Mts., New Mexico.
pudica, Pressy's Camp, Wenass Valley, Washington.

westcottii, Albuquerque, New Mexico.
erebus, Mesilla Park, New Mexico.
hamata, La Cueva, Organ Mts., New Mexico.
trita, Las Cruces, New Mexico.

Two co-types and seven homotypes of *danaus* in Coll. Am. Ent. Soc. are *Photopsis* and not *Odontophotopsis*.

Type and metatype of *bellerophon* have no crenulate ridge on mesosternum, which is simple; therefore they belong to *Photopsis*.

O. truncatus n. sp. may be the same as *simpliciventris* Mel.

O. mellicausa Blake has a fringe of plumose hairs on edge of second and third segments, some plumose hairs on disc of third segment, beyond the hairs are simple. To this extent the types disagrees with Mr. Melander's interpretation.

The contiguous punctures of mesonotum and the pit on the front instead of an impressed line will readily separate *O. sercus* n. sp. from *westcottii*, to which it is closely related. In *sercus* the first five segments have an apical fringe of plumose hairs, beyond this point the hairs are simple.

O. avellanus appears to be nearest *erebus* Mel., and like that species has an apical fringe of plumose hairs on all abdominal segments.

O. delodontus is related to *erebus*, and has plumose fringes on all segments. It is separated at once by the size and the well-separated punctures on the mesonotum.

DESCRIPTION OF A NEW GENUS AND OF FOUR NEW SPECIES OF HYMENOPTERA.

BY P. CAMERON.

ZETHOIDES gen. nov.

♂.—Antennæ clavate, the base of the flagellum narrowed; the scape as long as the following two joints united. Eyes large, converging below, the malar space almost obsolete. Clypeus about 3 times longer than wide, its apex rounded. Labrum hidden. Mandibles becoming gradually narrowed towards the apex. Maxillary palpi with at least 4, the labial with at least 3 joints. Abdominal petiole as long as the rest of the abdomen united, narrowed at the apex and at the base of the 2nd segment as in *Zethus;* 2nd segment bell shaped, as long as the other segments united. Ventral surface slightly convex. Radial cellule appendiculate, the stigma large; there are 2 transverse cubital nervures; the cubitus extends to the apex of the wings, its 2nd abscissa is the longer, the 1st the shorter; the first recurrent nervure is interstitial; the second is received at the base of the apical third of the cellule. Transverse basal nervure interstitial. Scutellum large, flat, its apex roundly margined. Median segment with a rounded slope towards the apex; reticulated, its centre with 2 longitudinal keels. Legs slender, the middle tibiæ with 2 spurs; the claws simple.

I am not quite certain if the wings fold naturally in repose or not. In one example they did do so after being moistened for the purpose of being cleaned. The presence of 2 spurs on the middle tibiæ removes the genus from the Eumenidæ, as do also the fact of there being only 2 transverse cubital nervures, which fact also separates it from the Vespidæ, which have 2 spurs on the middle tibiæ. There is no hook on the end of the antennæ as in the male Eumenidæ. The alar neuration and the clavate antennæ would place it with the Masaridæ, but from the known species in that group it may be readily separated by the long abdominal petiole (except from *Paramasaris*, which differs in other respects). It has very much the form of *Zethus*, especially in the form of the abdomen

The pronotum is transverse, but not acutely spined; the eyes are margined behind, as is also the occiput; there is a conical protuber-

ance below the antennæ extending to near the top of the clypeus; there is a deep, oblique furrow on the base of the mesopleuræ; at the foot of the metapleuræ is a wide deep furrow, divided into two by a stout ridge. Tegulæ moderately large. Parapsidal furrows absent. The basal half of the abdominal petiole is widely furrowed laterally. The mandibles are short, the apex of the one not reaching to the base of the other; they do not form a beak. Temples moderately large. Ocelli almost forming a triangle. Scutellar depression large, deep. The apical joints of the antennæ are not clearly separated.

In some respects this genus agrees with *Paramasaris* Cam., but, *inter alia*, that genus may be known by the recurrent nervures being received in different cellules—the 2nd and 3rd—while in the present genus they are both received in the 2nd. I have not ventured to run the risk of dissecting a specimen to make out the number of joints in the palpi, which may have a joint more than I have stated.

Zethoides flavolineatus sp. nov.

Black, the clypeus, apical half of tegulæ, extreme apex of petiole, a longitudinal line on the apical half of the 2nd abdominal segment, its apex—the line widest on the outer part—and the centre of the other segments, lemon-yellow. Flagellum of antennæ brownish beneath. Legs black, the apex of the fore femora, the outer part of the tibiæ and the base of the tarsi yellow. Wings fuscous-hyaline, the nervures and stigma black. ♂.

Length 7 mm.

Front and vertex strongly, but not closely, punctured; the eye incisions smooth, as is also the frontal tubercle and clypeus. Pro- and mesonotum opaque, strongly, but not closely, punctured; the pleuræ more shining, almost smooth, the sutures strongly crenulated. Metanotum reticulated; the 2 central keels become more widely separated towards the apex. The narrowed basal part of the petiole is irregularly rugose; the apex is sparsely punctured.

Hab.—Panama (Pacific side), J. J. Walker, R. N.

Paratiphia 12-maculata sp. nov.

Black, shining, the clypeus, the lower part of the inner eye orbits, a large, somewhat triangular mark on the sides of the pronotum, a large mark on the mesopleuræ below the tegulæ, a large mark, roundly narrowed at the base, on the apical two-thirds of the scutellum, the postscutellum, a small mark on the sides of the 1st abdominal segment, a large irregular one, longer than broad, and a smaller, broader than long, mark on the 3rd yellow. Wings uniformly fuscous-violaceous, the nervures and stigma black. ♂.

Length 12–13 mm.

Front strongly but not closely punctured, the centre more closely and strongly than the sides; the vertex less strongly and more sparsely. Pro- and mesonotum shining, strongly but not closely punctured; the parapsidal furrows deep. Scu-

tellums impunctate. The basal half of the metanotum deeply and closely punctured; in the centre irregularly transversely striated; the striæ curved and widely separated and bordered by a stout, smooth longitudinal keel; the sides and the apical slope slightly shagreened. Abdominal segments punctured, except on the apex; the penultimate segment is more opaque, thickly covered with black hair and with a smooth, shining keel in the centre; the last is more opaque and is stoutly keeled in the centre. Coxæ, trochanters and femora shining; the tibiæ and tarsi more opaque, thickly covered with a dark silvery pile; the calcaria black, the tarsal spines dark rufous.

Hab.—Panama, probably the Port (Mathew).

The large smooth tegulæ have only a few punctures at the base; they reach close to the apex of the scutellum; the flagellum of the antennæ is opaque, the middle joints slightly dilated below; the scape shining, strongly punctured and with short hairs; the base of the prothorax is stoutly keeled above; on the sides, behind this, is an oblique furrow; the apex of the metanotum and the base of the abdomen are covered thickly with a grey pile.

Nysson cressoni sp. nov.

Anal cellule of hind wings terminating at the origin of the cubital nervure; the hinder tibiæ not spinose; the 2nd ventral segment not angled. Black, densely covered with silvery pubescence; the apex of the labrum broadly, a mark on the apex of the clypeus at the sides, a line on the inner eye orbits opposite the tegulæ and the apices of the basal five segments of the abdomen, a line on the base of the fore tibiæ in front and the apical joints of the fore tarsi, yellow. Wings clear hyaline with black nervures. Flagellum of antennæ brownish beneath. ♀.

Length 5 mm.

Vertex sparsely punctured, densely covered with silvery pubescence; the lower part of the front impunctate. Pro- and mesothorax sparsely, weakly punctured, shining, as are also the scutellum and postscutellum; the pronotum with a widely interrupted yellow line. The basal area of the median segment shining, distinctly but not very closely punctured; the rest of the segment opaque, much more closely and less strongly punctured; there is a distinct pyriform depression on the apical slope, bordered by a furrow on either side; the projecting sides are largely and deeply incised in the centre; the incision is as long as it is wide at the apex. Abdomen shining, sparsely punctured; in certain lights with violaceous tints. Pygidial area opaque, broad, rounded at the apex, obscurely rugose. Temples not margined. Vertex and front without keels or tubercles.

The apical nervures in the hind wings are obliterated; the cubital cellule is confluent with the marginal and discoidal; the transverse cubital nervure is roundly curved outwardly.

Hab.—"N. Mexico."

I have had this little species in my collection marked as undescribed for many years. The label has written on it "N. Mexico;"

whether this means New Mexico or North Mexico I am unable to say now.

Polistomorpha nigromaculata sp. nov.

Fulvous, the thorax and head tinged with yellow. A triangular mark on the sides of the vertex, extending from the eyes to the outer ocelli, it becoming gradually narrowed from the outer to the innerside, a broad band on the centre of the occiput, 2 large irregular marks on the basal slope of the pronotum, a band on the apex, dilated in the middle to near the top of the basal slope, its base rounded and narrowed, a broader and much shorter dilatation on the sides, the mesonotum, except at the sides and apex, and two lines down the centre, a broad band on the base of the scutellum, its centre broadly extended to near the apex, the postscutellum, except in the centre at the apex, 2 marks on the metanotum, their sides straight on the inner side, rounded and narrowed towards the apex on the outer and a small mark on the end of the segment in front of them black. Legs fulvous, the hinder femora darker; there is a long fulvous, sharp-pointed tooth behind the middle, which extends beyond the tibiæ when they are pressed against the lower side of the femora; following this are 4 short, blunt black teeth closely pressed together and of equal size. Wings hyaline, slightly infuscated at the apex; the nervures fulvous. ♂.

Length 11 mm.

Apex of clypeus broadly rounded, projecting; there is a stout keel between the antennæ which extends down the face, becoming gradually smaller and more indistinct towards the clypeus; the vertex strongly punctured; the sides of the face and clypeus obscurely punctured and longitudially striated. Upper part of thorax closely and strongly punctured, the metanotum keeled down the middle. Pleuræ more sparsely and less strongly punctured. Abdominal petiole stout, broad, about one-half longer than broad, of almost equal width throughout. Dorsal surface of abdomen closely and distinctly punctured, the apical segments thickly covered with fulvous pubescence; the ventral surface shining, flat, sparsely punctured. Malar space slightly longer than the scape of the antennæ. Hinder coxæ sparsely and indistinctly, the femora and tibiæ closely and strongly punctured. Metapleuræ irregularly obliquely striated. Last segment of abdomen above stoutly keeled, the keels narrowed at the base and apex; in the centre is a shining, longitudinal line; the last ventral segment is broadly depressed in the middle, the depression more clearly defined at the apex, which is clearly separated, its sides straight and not obliqne like the posterior part. The flagellum of the antennæ is broken off from the 3rd joint; the 1st joint is yellow; the 2nd and 3rd blackish. Mandibular teeth black. Coxal tooth distinct.

Hab.—Panama.

This is the first species of *Polistomorpha* I have seen. It comes close to *P. surinamensis*, of which a good description is given by Schletterer. The two may be separated thus:

Apex of clypeus transverse; the femoral teeth irregular, with 4 large ones clearly separated, the body not largely marked with black.
surinamensis West.

Apex of clypeus distinctly rounded; the femora with only one large tooth, the body marked with black ..... **nigromaculata.**

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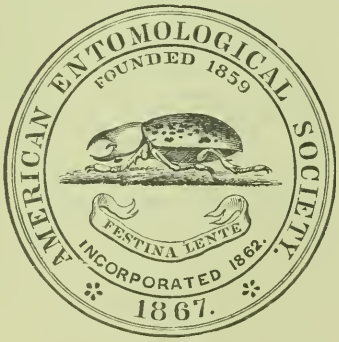

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NEUROPTEROID INSECTS FROM NEW MEXICO.

BY NATHAN BANKS.

A list of the Neuropteroid insects of any State or Territory must be more or less incomplete, since these insects are but little collected and our knowledge of these forms is yet comparatively slight.

The insects represented in the following list were collected almost wholly by Prof. Cockerell, or those associated with him. But New Mexico is such a large region, of such varied topography, that these insects, gathered from but a few localities, are but a small portion of the species that must exist in the Territory. Incomplete as this enumeration must now be, it is larger than can be made of many States, and exhibits several interesting facts. Prominent among such facts is the great preponderance of true Neuroptera. More species of Neuroptera are already known from New Mexico than can be collected in many eastern States. The Mecaptera, so far, are not present. The Trichoptera are not as numerous as in the East; but of these the Rhyacophilidæ are in larger proportion than usual. The Perlidæ all come from the northern part and are similar to those of Colorado. Although the northern and mountain parts of New Mexico have a fauna similar to Colorado, yet I suspect, judging from this collection, that in many regions where northern forms are predominant there are some species of the Mexican fauna. In other words, the faunas characteristic of certain altitudes, owing to their proximity, more or less intermingle. The faunas are not as distinct as if they were separated by latitude instead of altitude. I am aware that this is not the opinion of many who visit the region, but it is borne out by all collections that I have examined. I think the collector, seeing these different faunas so close together, is impressed too deeply by the contrast.

In this list there is a total of 97 species, of which 12 are new and here described. A description is also given of an ant-lion fly previously only known from Hagen's description of 1861.

The proportion of species in the various groups may be seen from the following table:

Perlidæ	13	
Termitidæ	3	
Psocidæ	4	
Ephemeridæ	6	
Archiptera		26

Sialidæ	1	
Raphididæ	1	
Mantispidæ	2	
Coniopterygidæ	1	
Hemerobiidæ	11	
Chrysopidæ	15	
Myrmeleonidæ	20	
Neuroptera		51
Limnephilidæ	8	
Rhyacophilidæ	5	
Sericostomatidæ	1	
Hydroptilidæ	1	
Hydropsychidæ	4	
Leptoceridæ	1	
Trichoptera		20
Total		97

Order ARCHIPTERA.

Suborder PLECOPTERA

Family PERLIDÆ

Acroneuria nigrita n. sp.—Black; head rather yellowish; antennæ brown; pronotum brown, a pale stripe in middle; thorax shining black, abdomen dull black; legs and setæ brown; wings with blackish veins. Pronotum in front about as wide as head, narrowed behind, sides straight, surface moderately rugose. Venation about as usual, but there are not as many branches of the radial sector beyond anastomosis as in other species (although this is variable). Ventral plate of female with a long deeply incised mark at tip, not seen in other forms. Length 21 mm.; expanse 54 mm.

Two females from Pecos, June (Cockerell). One micropterous male from the same locality probably belongs to this species, but is much smaller.

Pteronarcella badia Hagen.

Four specimens from Pecos, June (Cockerell).

Isogenus elongatus Hagen (?).

One female of an *Isogenus* which does not appear to differ from this species, Pecos, June.

Perlinella ebria Hagen.

From Las Vegas, June (Cockerell).

Perlinella frontalis Banks.

One from Beulah, May 30th (Cockerell).

Chloroperla 5-punctata Banks.

From Beulah, July 3d, and Las Vegas, June 9th (Cockerell).

Chloroperla coloradensis Banks.

From Beulah, July 11th (Cockerell); and Carriage House, Gallinas Canon, July 4th (Miss F. Beschle).

Chloroperla pallidula n. sp.—Pale yellowish; wings pale greenish; eyes, ocelli, margin of pronotum, posterior margin of meso- and metascutellum black; venation pale. Form rather elongate, pronotum as broad as head, anterior margin nearly straight, sides rounded, but tapering behind. Wings narrow, very few cross-veins; pedicel to fork of radial sector nearly as long as fork. Length 5 mm.; expanse 15 mm.

One specimen from Beulah, end of August (Cockerell).

Chloroperla signata Banks.

Two specimens of this well marked species from Pecos, June (Cockerell).

Capnia sp

One specimen from Las Vegas (Cockerell). Related to *O. vernalis*, but probably new.

Nemoura coloradensis Banks.

From Beulah, 8000 feet, and from top of range between the Sapello and Pecos Rivers, August 2d, 11,000 feet (Cockerell).

Nemoura cinctipes Banks.

One specimen from Beulah, May 3d (W. P. Cockerell).

Nemoura sp.

A rather large specimen of an undescribed species from East Las Vegas. I have the same species from Colorado. It has a large swollen plate at tip of the body.

Tæniopteryx sp.

One male from Las Vegas, March; very close to *T. pacifica*, but probably a different species.

Suborder ISOPTERA.

Family TERMITIDÆ.

Termopsis angusticollis Walk.

Specimens from Mesilla, June 28th (Cockerell); also recorded by Townsend, Zoe, vol. iv, p. 135 (1893).

Calotermes marginipennis Hagen.

Males from Mesilla (Morse), and Albuquerque, Nov.–Dec. (Cockerell).

Termes lucifugus Rossi.

Males from Las Vegas, March (Cockerell).

Suborder CORRODENTIA.

Family PSOCIDÆ.

Psocus cockerelli n. sp.—Head pale yellow, a median shining brown spot over the ocelli, a brown patch each side toward eye, and four brown patches on nasus, one near each corner; the nasus indistinctly brown lined, the labrum margined with brown. Basal joints of antennæ yellow, beyond brown; palpi yellow, last joint brown. Thorax pale yellow; a large spot on each lateral lobe of mesothorax and two spots on the median lobe are shining black. Abdomen brown, with some white markings. Legs yellow, the tarsi brown, and the femora with brown spots. Wings hyaline; venation brown, except the veins are white at bases, and the cubitus is white throughout, the cross-vein closing the discal cell and extending down to posterior margin and on the upper branch of the median vein is white; the lower branch of radial sector is also white at base. Pterostigma white, with a large black spot in posterior part; a brown spot at tip of anal vein. The nasus is large, subquadrangular, with about twelve vertical rows of short white hairs. Antennæ slender, hairy; reaching beyond tip of thorax. Eyes small and spherical, but rather prominent. The discal cell is very much longer than broad at base, and much narrowed toward tip; it reaches the radial sector (thus no anterior cross-vein).

From Whitewater, by White Sands, on aster, October 6th (Cockerell). A very handsome and distinct species.

Psocus trifasciatus Prov.

Prof. Cockerell collected some at Dripping Springs, Organ Mts., August 20th.

Psocus oregonus Banks.

Mr. Schwarz took some from Las Vegas Hot Springs, Aug. 13–17.

Psocus sp.

One specimen of a dark-winged species from Beulah; it is very close to *Ps. sparsus*, but I think different.

Suborder ANISOPTERA.

Family EPHEMERIDÆ.

Hexagenia limbata.

One specimen from Roswell, August (Cockerell).

Ephemerella grandis Eaton.

One from Beulah (W. P. Cockerell).

Choroterpes inornata Eaton.

One from Las Vegas (Oslar). Described from Mexico and Arizona.

Callibætis undata Pictet.

Several specimens from Beulah, Sept., in spider's web (Cockerell); and Las Vegas Hot Springs, August 2–19 (Schwarz and Barber).

Cleon sp.

Specimens from Las Vegas Hot Springs, August 2–9 (Schwarz and Barber).

Heptagenia longimanus Eaton (?).

Several specimens which agree fairly well with Eaton's description come from Sapello Canon, July 27th (Oslar); and Beulah, July (Cockerell).

Order NEUROPTERA.

Suborder MEGALOPTERA.

Family SIALIDÆ.

Corydalis cognata Hagen.

Recorded from Pecos River, western Texas (now New Mexico). I have it from Arizona.

Family RAPHIDIDÆ.

Raphidia minuta Banks.

One from Beulah, August 13th (Cockerell).

Suborder STEGOPTERA.

Family MANTISPIDÆ.

Mantispa brunnea Say.

One from Rio Ruidoso, White Mountains, 8500 feet, August 6th (Townsend).

Mantispa interrupta Say.

From Las Vegas Hot Springs, Aug. 8–13 (Schwarz and Barber).

Family CONIOPTERYGIDÆ.

Coniopteryx sp.

A species of this genus was taken by Mr. Schwarz at Las Vegas Hot Springs, August 5th.

Family HEMEROBIIDÆ.

Megalomus mœstus Banks.

Two from Santa Fé, July, August (Cockerell).

Megalomus latus Banks.

From Beulah, July (Cockerell); Las Vegas Hot Springs, August 6th (Schwarz and Barber), and Pecos, August 12 (Cockerell).

Micromus variolosus Hagen.

Several from Las Vegas (Cockerell); Las Vegas Hot Springs, August 2–8 (Schwarz and Barber), and Pecos, June.

Micromus montanus Steph.

One specimen from Beulah, July 27th (Cockerell).

Hemerobius pacificus Banks.

Several specimens from Santa Fé, August (Cockerell), and Las Vegas Hot Springs, August 11th (Schwarz and Barber).

Hemerobius mœstus Banks.

Two from Las Vegas Hot Springs, Aug. 5–9 (Schwarz and Barber).

Hemerobius cockerelli Banks.

Top of Las Vegas Range (Cockerell); Las Vegas Hot Springs, August 6th (Schwarz and Barber).

Hemerobius schwarzi Banks.

One from Mesilla (Morse).

Hemerobius umbratus Banks.

One from Albuquerque (Oslar).

Hemerobius perparvus McLachlan.

Various specimens from Mesilla (Cockerell), and Las Vegas Hot Hot Springs, August 5th (Schwarz and Barber).

Hemerobius augustus n. sp.—Body brownish throughout, antennæ similar, the legs pale yellowish. Wings faintly clouded, neuration dark brown, but the longitudinal veins, especially in the middle of the wings, are dotted with pale. The cubital vein broadly brown, and some of the anal veins and along the anal margin also broadly brown; the costal venation wholly brown; some pale spots along outer and posterior margins of wings. Hind wings hyaline, faintly clouded along posterior margins, and at the pterostigma; the venation brownish, the costals darker. Fore wings rather long and narrow, the costal region narrow at base; first branch of radius connected back to radius before origin of second branch. In the hind wings the radial sector at base is connected back to radius to form a small closed cell near base of wing. Length 5 mm.; expanse 10 mm.

One specimen from Mesilla, N. Mex. (Morse), and others from Las Vegas Hot Springs, August (Barber and Schwarz). In National Museum collection.

Family CHRYSOPIDÆ.

Chrysopa oculata Say.

Several specimens from Beulah, July 25th (Cockerell); Rio Ruidoso, White Mts., 6500 feet, August 1st (Townsend); Santa Fé, 7000 feet, July (Boyle).

Chrysopa chlorophana Burm.

A few specimens: Beulah, 8000 feet (Cockerell); Pecos, June; Sapello Canon, July 27th (Oslar); and Las Vegas Hot Springs, August 11th.

Chrysopa schwarzi Banks.

Type is from Las Vegas Hot Springs, August 8th (Barber and Schwarz).

Chrysopa coloradensis Banks.

From Santa Fé, July (Cockerell); one specimen.

Chrysopa erythrocephala Banks.

Several specimens from Mesilla, July 18th (at light) (Cockerell); and Albuquerque, July 13th, and Gallinas Canon, July 24th (Oslar).

Chrysopa cockerelli Banks.

One specimen from East Las Vegas (Cockerell).

Chrysopa rufilabris Burm.

Several specimens from Gallinas Canon, July 25th (Oslar); and Mesilla (Morse).

Chrysopa sabulosa Banks.

One specimen from Mescalera, October 1st; one from Spark's Ranch, Pecos Canon, July 27th, 7500 feet (Cockerell).

Chrysopa chi Fitch.

One specimen from Pecos, June 19th; agrees with eastern specimens throughout.

Chrysopa plorabunda Fitch.

Specimens from Albuquerque, September; Pecos, June 30th; and Spark's Ranch, Pecos Canon, July 27th, 7500 feet (Cockerell).

Chrysopa arizonensis Banks.

A few specimens from Gallinas Canon, July 25th (Oslar).

Chrysopa externa Hagen.

Various specimens from Las Cruces, 3800 feet, June 8th, and Santa Fé, July (Cockerell); and Mesilla.

Meleoma mexicana Banks.

One from Santa Fé, July (Cockerell), also from Las Vegas Hot Springs, August 9th (Schwarz and Barber).

Eremochrysa punctinervis McLach.

From Mesilla and San Augustine (Cockerell). Common species in the arid regions of the Southwest.

Eremochrysa fraterna Banks.

One specimen of this uncommon species from Pecos, August 13th. Prof. Cockerell states that the markings are of a lilac color in life.

Family MYRMELEONIDÆ.

Acanthaclisis hageni Banks.

From Albuquerque, July (Oslar).

Brachynemurus tenuis Banks.

Three from Mesilla, June 30th (Morse).

Brachynemurus tuberculatus Banks.

One, the type, from Mesilla, June 30th (Morse).

Brachynemurus longipalpis Hagen.

From Albuquerque (Oslar).

Brachynemurus nigrilabris Hagen.

Many specimens from Las Vegas, July (Oslar); and Mesilla Park, September 13th, at light (Cockerell).

Brachynemurus abdominalis Say.

From Las Vegas, July 1 (Oslar).

Brachynemurus ferox Walker.

One from Albuquerque (Oslar).

Brachynemurus pusillus Currie.

One from Mesilla Park, September 16th (Cockerell). This species is remarkable on account of its very large bristles.

Brachynemurus hubbardi Currie.

From Lone Mts., July (Cockerell), and near La Luz, Aug. 23d (Townsend).

Brachynemurus blandus Hagen.

From Albuquerque, July 12th (Oslar); a few specimens.

Brachynemurus texanus Banks.

Two specimens from Albuquerque (Oslar). Two specimens from Phœnix, Arizona, labelled by Mr. Currie as his *B. intermedius*, are in my collection and appear to be the same species. The New Mexico specimens are smaller than the others.

Brachynemurus versutus Walker.

One specimen from mouth of Sapello Canyon, September (Cockerell), and two from Pecos, August 30th (Cockerell). This Mexican species has not previously been recorded from the United States; but I have also specimens from Colorado.

Brachynemurus elongatus n. sp.—Face yellowish; a brown interantennal mark, slightly concave below, two nearly parallel brown bands on vertex, the posterior one broken in the middle; palpi small, pale, last joint partly blackish; antennæ yellowish brown, reaching to tip of mesothorax. Prothorax with a broad brown stripe, each side separated by a narrow but distinct median yellow line, each brown stripe contains a pale spot near front end, and is incised from within at the middle; the side of pronotum has a narrow brown stripe, not reaching the front margin. Thorax mostly covered with brown, two brown stripes on scutellum, a pale dot on each anterior lateral lobe, and two pale stripes each side. Abdomen brown, paler at base above, with traces of a median brown line; last segment black, with a median yellow dot above; appendages dark, about one-fourth as long as last segment. Legs pale yellowish, dotted with brown; anterior tibiæ on outside with brown bands, and some of tarsal joints are brown; clothed with some black and more white hairs. Wings hyaline, slightly marked with brown along the principal longitudinal veins and at the pterostigma, much as in *B. brunneus*, but not so heavily. Venation mostly brown, some cross-veins white. Wings more slender than *B. brunneus* and more acute at tips. Length, ♂, 47 mm.; expanse 50 mm.

Two males from Mesilla, June 30, 1897 (Morse). These are the two males I referred doubtfully to *B. centralis* (*brunneus*); but they are distinct from the male of that species by their longer abdomen; last segment longer, with shorter appendages, and the vertex is not so elevated as in that species.

Brachynemurus coquilletti Currie.

From Albuquerque, July 12th (Oslar).

Brachynemurus brunneus Currie.

Various specimens from Las Vegas, July (Oslar).

Brachynemurus sackeni Hagen.

A pair from Kin Kale Ranch, Pecos, June 23d, at light (Cockerell). It appears to be more common in Arizona.

Myrmeleon rusticus Hagen.

Several from Albuquerque, July (Oslar).

Myrmeleon immaculatus De Geer.

Specimens from Albuquerque (Oslar). They are of the form described by Mr. Currie as *M. immaculatus occidentalis*. They appear to vary a great deal in extent of markings. Some of the specimens are much smaller than the eastern ones.

Psammoleon ingeniosus Hagen.

Recorded by Hagen from the Territory. I have not seen it from New Mexico, but from Arizona.

Psammoleon inscriptus Hagen.

One specimen from Las Vegas (Oslar). This species has not been recorded since its description by Hagen in 1861, as from Western Texas, now New Mexico. I give below a fuller description.

Face yellowish; an interantennal mark extending up over the entire vertex, with a pale transverse line. Antennæ dark brown, reaching to base of fore wings. Pronotum dark brown, with a narrow median yellow line, and a short stripe each side and a spot in front; thorax nearly black, with yellow dots; one in front of each wing, two in front above, and behind are two pair and one median spot; metathorax not distinctly spotted; pleura more yellowish. Legs mostly dark, with white hair; anterior tibiæ have two pale bands; posterior tibiæ at base pale; spurs as long as first two joints (first joint very long), tarsi slender, posterior ones as long as tibiæ. Abdomen black, faintly marked with yellow at tips of segments. Wings scarcely hyaline, veins nearly all rather broadly marked with brown, some white veins; in certain light white patches toward the base; a flexuous, bi-incurved brown line from basal third of posterior margin to tip of wing. Pterostigma brown. Hind wings similarly marked, but less heavily, and without the flexuous line. Costal area of fore wings with a partial double row of cells (in my specimen). Seven cross-veins before origin of radial sector, and in hind wings but one. Length 26 mm.; expanse 56 mm.

It differs in many points from *Ps. ingeniosus*, particularly in the more slender tarsi, the denser venation, the partial double row of cells between anal and cubital veins in the forewings, and in the markings. Nevertheless, there is such a general affinity to that species that I am loath to erect a new genus for it; the more so as one form of *Ps. ingeniosus* (*simuatus* Currie) has a similar line on the wings.

Order TRICHOPTERA

Family LIMNEPHILIDÆ.

Limnephilus cockerelli Banks.

Specimens from top of range between the Sapello and Pecos Rivers, August 2d, 11,000 feet; Top of Las Vegas Range; and Moro, June 28th (Cockerell).

Asynarchus costalis Banks.

From Las Vegas Range, June 28th (Cockerell).

Platyphylax designata Walker.

Various specimens from Beulah, 8000 feet, July 27th, August 16th; Chicorico Canon, near Raton, August 25th (Cockerell).

Dicosmœcus atripes Hagen.

Several specimens from San Ignacio, September 1st (Porter and Cockerell); and Sapello Canon, July 25th (Oslar).

Dicosmœcus maculatus n. sp.—Face reddish yellow, clothed with appressed hairs same color; vertex reddish, mostly with whitish hairs, some yellow in front; antennæ pale reddish brown, basal joint as long as length of head, ocelli of moderate size, posterior warts narrow, obliquely transverse; palpi yellowish; thorax pale reddish brown, with a paler, broad, median stripe, the latter clothed with yellowish hair. Prothoracic and mesothoracic lateral lobes with tufts of yellowish bristles; abdomen brown; legs dull reddish, with black spines and reddish spurs; spurs 1-3-4. Anterior wings brown, darker beyond anastomosis, costal area wholly pale, elsewhere (except anal region) with round pale spots, often confluent; slightly beyond anastomosis is a pale cresent across the apical cells, and in the distal part of the fourth apical is a pale streak; there are also two large pale patches, one covering the apex of the thyridial area and base of first subapical cell, and the other obliquely across thyridial area and cell; sometimes another pale spot near base; anterior veins to anastomosis pale yellow, others brown. The discal cell is shorter than in allied species, but little longer than its pedicel, not reaching near as far back as the thyridial cell; the first and fifth apical cells extend equally far back of anastomosis, otherwise venation is like *D. argus*, save that the radius is slightly more sinuate before the pterostigma. Hind wings hyaline, slightly clouded at tips and along costa, veins yellowish, venation like *D. argus*. Length 18 mm.; expanse 46 mm.

Described from two specimens, one from Pecos, N. Mex., August 24th (Cockerell), at light; the other from S. Arizona, August, 1902 (F. H. Snow).

Halesus minutus Banks.

Specimens come from Gallinas Canyon, July 29th (Oslar); Beulah, July 11th to 27th; and El Macha, July 21st (Cockerell). Many of the specimens are smaller than the types from Colorado.

Anabolina diversa Banks.

Specimens of this species were taken at Las Vegas, May 17th, at light (Cockerell). They are rather larger than the Arizona specimens.

Psilopteryx (?) brevipennis n. sp.—Pale yellowish; abdomen brownish above; venation brown. Clothed on head and thorax with whitish and yellowish hairs, longest on the prothorax above; wings sparsely hairy along the veins, as well as on the margins. Head rather broad, slightly depressed in middle of vertex, ocelli small, two transverse posterior warts; face retreating; basal joint of antennæ moderately large. Prothorax distinct from above, about four times as broad as long. Legs of moderate size, with many black spines; spurs (♀) 1–3–4, yellowish. Wings (♀) short; anterior pair not reaching tip, and posterior pair scarcely extending beyond middle of abdomen; the former broad and broadly rounded at tip, the latter much narrower and acute at tip; discal cell triangular, reaching nearly half-way to base, fifth apical cell narrow at base. Abdomen large, largest toward tip. Length 8 mm.

One female from Beulah, 8000 feet (Cockerell). It is not a *Psilopteryx* as that genus is now defined. However, by shape of wing, unbent radius near pterostigma, and shape of head, it is allied to *Chætopteryx*, differing from it in not having hairs on wing-membrane (just as *Psilopteryx*); however, it differs from both these genera in the spur formula. It may be a *Psilopteryx* when these genera are based on more natural characters.

Family RHYACOPHILIDÆ.

Rhyacophila stigmatica n. sp.—Black; head with sparse black hair; antennæ faintly annulate; legs pale yellow, a dark mark on tips of tibiæ and on tips of tarsal articles, much more distinct in male, and most distinct on the anterior legs, absent in hind legs of female; spurs yellow. Wings black, more or less guttate with pale yellowish, in male heavily marked, in female with few spots and these chiefly at margins; a larger yellow spot near anal angle; pterostigma darker than elsewhere, in hind wings very dark and prominent, especially in males; the apical part of hind wings infuscated, veins blackish. Length to tip of wings 11 mm.

Specimens come from Las Vegas, July 10th, and Beulah, July 27th (Cockerell); also from Colorado. The female, which is but little marked, looks like *R. pacifica*, but the wings, especially the hind pair, are not near so dark.

Glossosoma parvula n. sp.—Dark brown; head clothed with white hair; posterior warts small, transverse; palpi dark; antennæ pale yellowish, darker toward tip; thorax with white hair; abdomen dark brown; legs pale yellowish, with brown spurs. Wings rather sparsely clothed with black and golden hairs, the basal half mostly golden; a whitish spot at end of thyridial cell; veins and apical fringe dark brown; venation as usual; fifth apical cell reaches as far back

as the third, and farther back than the next fork behind. Hind wings dusky, with dark fringe. The ventral process of abdomen equally broad throughout; the apical process rather small. Expanse 11 mm.

Three specimens from Pecos, August 10th (Cockerell).

Glossosoma ventralis n. sp.—Dark brown; head clothed with white hairs, posterior warts transverse, a small round wart just within each ocellus; palpi dark; antennæ pale yellowish, darker toward tip; thorax with white hair; legs pale yellowish, spurs brown; abdomen dark brown. Wings sparsely clothed with black and yellowish hairs, mostly black; a whitish spot at apex of thyridial cell, and a yellowish spot at anal angle; apical fringe and venation dark; fifth apical cell not as far back as the third, but as fas as next fork behind. Hind wings dusky, veins and fringe dark, pterostigma brown. Ventral process of abdomen broader at tip than base, broader than in *G. parvula*, and the apical process is larger than in that species. Expanse 15 mm.

One specimen from East Las Vegas, July (Cockerell). There is also a female *Glossosoma* from the White Mts., August 9th, Rio Ruidoso, 6500 feet (Townsend), of the same size as *G. ventralis*, but I think it belongs to another species, for the wings seem more acute at tips.

Agapetus sp.

One specimen from Pecos, August 27th (Cockerell). It looks much like the eastern *A. obscura* Walk., but is probably different.

Family SERICOSTOMATIDÆ.

Helicopsyche sp.

Larval cases of this genus were taken from Gallinas Canyon.

Family HYDROPTILIDÆ.

Hydroptila sp.

A pretty spotted species of this genus comes from Pecos, June 20th, at light (Cockerell).

Family HYDROPSYCHIDÆ.

Hydropsyche scalaris Hagen.

Several specimens of this species, identical with eastern specimens, come from Pecos, August 10–14 (at light), and from Santa Fé, August (Cockerell).

Hydropsyche divisa Banks.

One specimen from Roswell, August 22d (at light). Previously known only from Arizona.

Hydropsyche novamexicana n. sp.—Head brown, clothed with white hairs and erect black bristles from posterior warts; the latter are large and transverse; eyes of male not large, wide apart. Antennæ pale, with white hairs, spirally annulate with black; legs pale, with whitish hair; spurs yellowish; thorax brown, clothed with white hairs; abdomen pale yellowish, with whitish hair. Wings hyaline, with yellowish hair, densely irrorate with dark brown, most heavily beyond anastomosis, pterostigma dark. Vein closing discal cell comes close to base of lower fork some distance from upper fork. Apical fringe alternately black and yellowish. Male claspers broad at tip and bifid. Length 10 mm.

Males from Roswell, August 21st, and apparently the same from Embudo, September 25th, at light (Cockerell).

Hydropsyche sp.

Two specimens from Roswell, August 22d, at light (Cockerell), represent another species, probably undescribed.

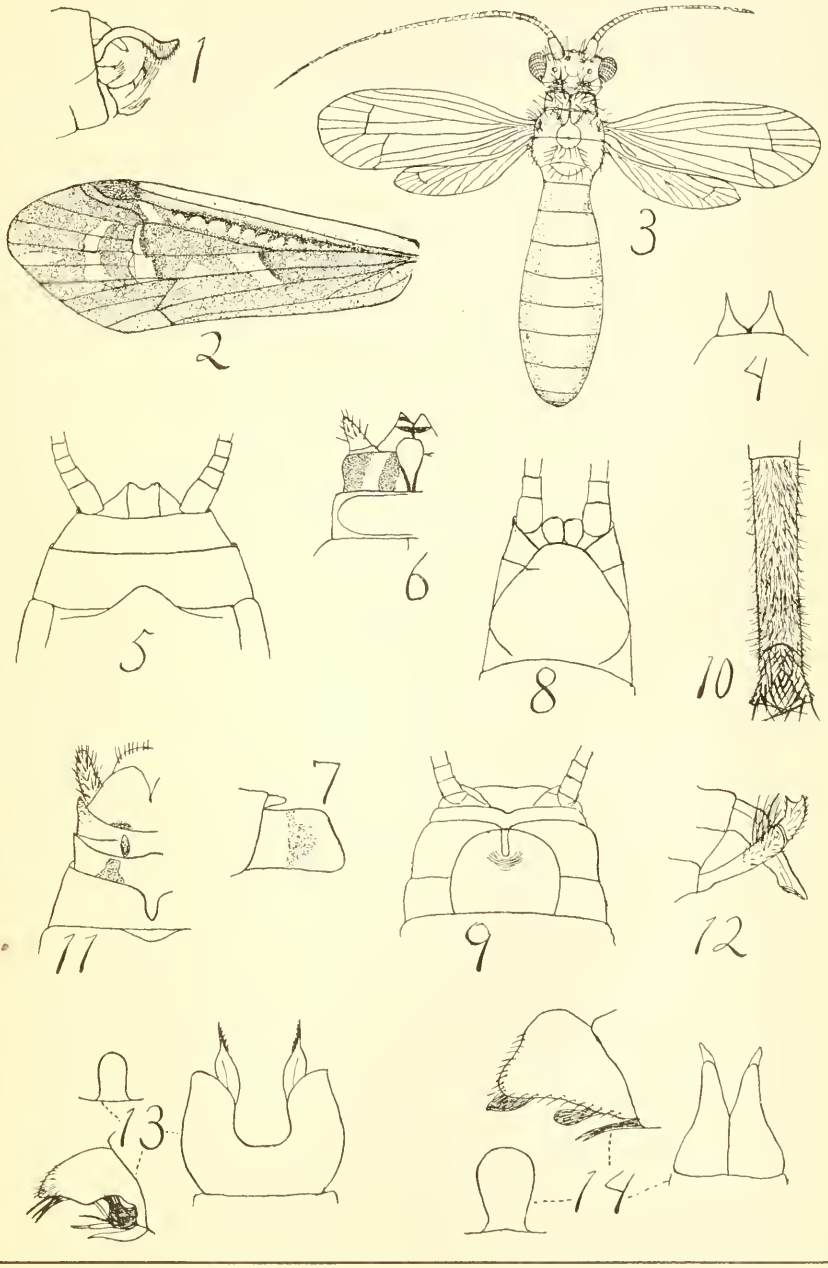
Family LEPTOCERIDÆ.

Leptocella gracilis n. sp.—Pale yellowish, short and sparse hair on front of head and basal joints of antennæ; thorax above with long dense hair, antennæ dark, the joints on basal one-third are pale on bases, fully twice as long as wings; palpi with short, rather sparse white hair; legs yellowish, the hind tibia with a row of long white hairs below on basal portion, spurs 0–2–2, quite short. Anterior wings sparsely clothed with yellowish hair; venation dark toward tip of wings, fringe on outer margin mostly black; hind wings pale greyish, with pale venation and fringe. Structure similar to *L. exquisita*, but the wings more slender and more pointed at tips; the basal joints of antennæ very large and contiguous; the venation similar to that species, but the discal cells longer, and the fifth apical cell longer pedicellate. Length to tip of wings 15 mm.

One male from Gallinas Canyon, July 30th (Oslar).

EXPLANATION OF PLATE I.

Fig. 1. *Leptocella gracilis*, male genitalia.
" 2. *Dicosmœcus maculatus*, wing.
" 3. *Psilopteryx brevipennis*.
" 4. *Dicosmœcus maculatus*, tip of abdomen.
" 5. *Chloroperla 5-punctata*, tip of venter.
" 6. *Nemoura coloradensis*, male.
" 7. *Rhyacophila coloradensis*, tip of abdomen.
" 8. *Chloroperla pallidula*, tip of female venter.
" 9. *Acroneuria nigrita*, tip of female venter.
" 10. *Brachynemurus elongatus*, tip of abdomen.
" 11. *Nemoura coloradensis*, female.
" 12. *Hydropsyche novamexicana*, genitalia.
" 13. *Glossosoma parvula*, ventral plate, genitalia.
" 14. *Glossoma ventralis*, ventral plate, genitalia.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THE LABIUM OF THE ODONATA.

BY HORTENSE BUTLER.

In the selection of this subject for investigation I was influenced primarily by the lack of knowledge in regard to two important aspects of the study of this remarkable appendage. In the first place, up to the present time, no attention whatever has been paid to the mechanism of the labium, and in the second place while some attention has been devoted to the homologies of its parts, the results appear to me incomplete and their supporting evidence insufficient.

Aside from the discussion by Gerstaecker, of which a detailed account will be given in the proper place, we have only very few paragraphs embodied in papers on other subjects, by Rambur, Hagen, Brandt, Calvert and Heymons. The object of this paper is to present such new information as has been obtained and to supplement and in some cases correct the old.

The work has been carried on entirely in the biological laboratory of Lake Forest College and under the supervision of Prof. J. G. Needham.

The adult material used was obtained entirely from his collection, with the exception of some specimens loaned by the U. S. National Museum, the Museum of Comparative Zoology, and the Imperial Museum of Berlin, which were at that time in his possession. The series of mounted adult labia studied was prepared by me from specimens obtained from this source. With regard to the ontogenetic material, the eggs of *Anax junius* were obtained when laid by collecting stems in which the females were observed ovipositing, and developed in confinement. The embryonic stages studied were taken from eggs respectively seventeen and twenty days old. The embryonic stage of *Lestes uncata* was obtained from some aestivating eggs collected by Prof. Needham, and the time which had elapsed since they were laid was uncertain.

The majority of the drawings were made by me directly from the specimens. A few, however, were made from photographic plates and some from unpublished drawings by Prof. Needham.

I. The Mechanism of the Labium.

Every one who has devoted any attention whatsoever to the study of the Odonata has been impressed by the enormously developed

and curiously shaped labium. This labium, which has been, not inaptly, compared to a mask, in the Libellulidæ completely covers the remaining mouth parts, and in the other families very nearly does so. At first glance it seems unweildy in size and shape, but it is capable of remarkably swift and accurate movement. If one observe large nymphs of *Anax junius* in proximity to which a few *Ischnura* nymphs have been placed, it will be seen that directly the latter are brought near, the *Anax* nymphs remain perfectly quiet until the prey comes quite close to them, then with a motion so swift as to preclude observation the labium is darted out, the victim seized and instantly drawn up into a position in which the mandibles can be used with advantage. The strength of the labium is surprising: indeed, when the animal is held suspended in the air by its extended tip, it can with ease lift the weight of its entire body up to the support.

The powerful muscles and hinges which constitute the mechanism of the labium have never hitherto been investigated. The various movements are, however, secured by a comparatively very simple apparatus. For an understanding of the mechanism of the labium it would be necessary, first of all, to consider what are the various divisions composing it.

The typical labium consists of a submentum and (*sm.* Pl. II, Fig. 1) mentum (*m.* Pl. II, Fig. 1), a ligula (*li.* Pl. II, Fig. 1) which varies greatly in shape in the various families; to lateral lobes (*ll.* Pl. II, Fig. 1) each bearing a movable hook (*mh.* Pl. II, Fig. 1) and terminating in an end hook. These various parts are hinged together at four points, the movable hooks are hinged onto the lateral lobes, the lateral lobes in their turn are hinged onto the mentum at the apical hinge, and there is a hinge at the joining of the mentum and submentum, the middle hinge, and another at the juncture of the submentum with the head, the basal hinge.

The movable hook is without muscles. Four pairs of muscles are so arranged in connection with the apical, middle and basal hinges before mentioned, as to produce all the movements of which the labium is capable. These are a pair of abductors (*aa* .Pl. II, Figs. 1 and 2), a pair of adductors (*bb.* Pl. II, Figs. 1 and 2), a pair of extensors (*dd.* Pl. II, Figs. 1 and 2), and a pair of flexors (*cc.* Pl. II, Figs. 1 and 2). The adductors, which are fastened to the external tendenous prolongation of the lateral lobe at its insertion into

mentum, and which have their origin in the floor of the submentum proximal to the middle hinge, serve to throw the lateral lobe out as the labium is thrust out. The adductors which are inserted at the inner tendenous prolongation of the lateral lobe, and which also originate in the floor of the submentum at a point a little distal to the origin of the abductors, serve to draw the lateral lobe down against the ligula. The extensors have their origin upon the backward prolongation of the hypo-pharynx, and passing over the flexors and above the adductors near their origin, are inserted upon the hind ventral margin of the mentum below the hinge. These extensors, by pulling over the basal hinge and the middle hinge, obtain the leverage necessary to throw the entire labium out to its full length. The flexors, originating upon the tentorium, somewhat above the origin of the extensors, and inserting into the supero lateral margin of the mentum distal to the hinge, by means of a tendon, fold the labium down into a position of rest.

Thus by the action of the adductor muscle, in combination with the extensor, the labium is thrust out, the lateral lobes opened, and the movable hooks mechanically extended; then when the victim is within touch, with a movement equally rapid and concerted, the adductor working with the flexor, the lateral lobes are drawn down, the labium closes and the prey is held in a position in which it can most easily be devoured.

II. ONTOGENY OF THE LABIUM.

LESTES.

Amazingly various as are the shapes of the labium, more especially the shapes of the lateral lobes, in the various families of Odonata, I thought it probable that greater simplicity of conditions might be discovered in the early nymphal and embryonic stages and that in this way some new light might be thrown upon the homologies of parts. With this in view I studied a series of labia of *Lestes uncata*, beginning with the embryonic stage (Pl. V, Fig. 13), the stage at which the development is temporarily stopped when aestivation begins (see account of the life history of *Lestes* by Prof. J. G. Needham in Bull. 68 of the N. Y. State Museum, pp. 228–230, 1903), and passing through a series of eight nymphal stages up to a condition approximating that of the full grown nymph (Pl. III, Figs. 1–8).

In the drawing made from the embryonic labium (Pl. V, Fig. 13) it will be observed that the development of the ligula (median lobe) is very imperfect in comparison with that of the lateral lobes. In the median cleft is a double basal series of teeth representing probably the inner laminæ of Gerstaecker, with the lobe above terminates an important second series, representing probably the outer laminæ. This is probably another case of retarded development. In the lateral lobe the movable hook is already well developed and separated from the remaining parts; the teeth are developed on the distal margin and to a less extent on the inner margin; the one at the end is already differentiated as end hook. In the earliest of the nymphal stages (Pl. III, Fig. 1), the lateral lobes are separated by a low broad ligula which has developed extraordinarily and which shows a trace of a cleft in the middle. On either side of this cleft are two teeth, the precursors of those lobes which in the full grown nymph extend across the entire width of the mentum. The suture between the ligula and the mentum (possibly, between inner and outer laminæ: its relation to these as shown in the earlier stages has not been fully traced), which in nymphs has hitherto been entirely overlooked, appears as a transverse line with a pair of minute teeth at its distal border. The position of the teeth on the lateral lobe is much changed, owing perhaps to lateral expansion, the end hook is less evident, but the development of the other teeth is about the same as in the previous stage.

In the next stage (Pl. III, Fig. 2), after the second moult, a well developed seta is observed on the lateral lobe and the beginning of one on the movable hook, one is also present on either side of the mentum, but this last is not included in the figure. The number of teeth on the inner edge of the lateral lobe has increased, while among those on the end, the one which later forms the end hook is conspicuous by its size, and is already divided from the others by an oblique cleft. The number of teeth on the ligula has increased and the cleft is deepened, while a pronounced tooth has developed on the sutural line before mentioned.

In the third stage (Pl. III, Fig. 3) the seta on the movable hook has attained its full development, the cleft between the end hook and the remaining teeth has become more marked, while the number of teeth on the ligula is still further increased, and the edge of the ligula on either side of the cleft has become slightly elevated.

After the fourth moult (Pl. III, Fig. 4) a differentiation is noticeable among the end teeth, the two at the extreme edges becoming slightly larger than the others and turning outward, away from them. Two setæ make their appearance on the mentum. In the next stage (Pl. III, Fig. 5) the principal change is in the gradual disappearance of the sutural line, the rest of the development seems to be practically stationary.

In the sixth of the series (Pl. III, Fig. 6) a second seta makes its appearance upon the movable hook, while the terminal teeth of the end group have become larger and are separated from the others by deeper clefts. Three setæ appear upon the mentum on either side. In the succeeding stage (Pl. III, Fig. 7) the separation between the terminal teeth of the end group and their companions has increased and there is an increase in the number of teeth on the border of the ligula. In the stage represented in Plate III, Fig. 8, we find a condition very similar to that of the full grown nymphal labium. A third seta has developed on the movable hook and three are present on the mentum. The clefts between the end hook and the end teeth and the terminal teeth of the end group and the central ones have reached their maximum depth. The number of teeth on the inner edge of the lateral lobe and on the ligula has reached its maximum. The line beneath the border of the ligula has become a mere trace, the tooth which figured so prominently in the early stages being represented by a chitinized spot. The cleft in the ligula has reached its greatest depth. With the exception of a few additional setæ upon the mentum, this stage represents the full-grown nymphal labium; no more changes take place until the transformation from nymph to adult.

ANAX and BASILESCHNA.

The series of *Anax junius* contains two nymphal labia in different stages of development, and two embryonic labia. In the youngest embryonic labium (Plate IV, Fig. 1) the mentum is composed of two lobes separated by a deep cleft running almost to the submentum. The ligula is as yet undeveloped. The movable hook is not as yet separated from the rest of the lateral lobe; in shape it strongly resembles the palpus of the maxilla. In the succeeding stage (Pl. IV, Fig. 2) we have a condition much further advanced and comparable to the embryonic labium of *Lestes uncata* (Pl. V,

Fig. 13). In this the hook-like character of the movable hook has become apparent and teeth have been developed along the end of the lateral lobe and two upon the inner edge. Teeth have developed in a double series at the base of the cleft between the two divisions of the mentum, and immediately above the lower series is a marked indentation which appears to be the beginning of a suture dividing each lobe of the developing ligula into two parts. The shifting which these parts undergo in forming the ligula as it appears in the nymph will be discussed later.

The earliest of the nymphal labia (Pl. IV, Fig. 3) shows comparatively little change in the lateral lobe. The number of teeth along the end has increased, and two rudimentary setæ have appeared just below the movable hook. These setæ are exceedingly interesting from an historical standpoint, as raptorial setæ never appear upon the later nymphal or upon the adult labia of *Anax junius*, and were believed never to be present in the family. In contrast to the lateral lobe, the ligula has developed enormously, having almost the appearance which it exhibits in a full grown nymph, with the exception of a group of four teeth on either side of the cleft. The suture beneath the border of the ligula, which was noted in *Lestes uncata*, appears here also. In the next succeeding stage (Plate IV, Fig. 4) we have a slightly later stage of development. The differences are, however, slight, consisting in the appearance of a number of teeth on the inner edge on the end hook and of a second group upon the border of the ligula.

The development of the labium of *Basiaeschna janata* is along much the same lines as that of *Anax*. In the condition shown in Pl. IV, Fig. 5, we have a state strictly comparable to that shown in Fig. 4 of the same plate. In this figure one of the teeth upon the end is already slightly separated from the others and has become longer. It is this tooth which remains as the end hook while the others disappear. In a later stage (Pl IV, Fig. 6) teeth have appeared upon the inner edge of the lateral lobe and hairs are doveloped along the edge of the ligula. In the next stage (Pl. IV, Fig. 7) the only difference is the decrease in size of the teeth on the end of the lateral lobe and on either side of the cleft in the ligula, and in the almost complete closure of that cleft. In the last stage Plate IV, Fig. 8) the end hook has become more hook-like. The one tooth has become a hook itself, and the others are represented

only as chitinized spots. The teeth on the inner edge of the lateral lobe have increased in number, while those on either side of the cleft in the ligula have disappeared, being represented only by a band of chitin. The hairs along the border of the ligula, which, in the early stages, were small, have increased in size and covered the entire border up to the cleft. The cleft is represented only by a slight depression and by a line extending down upon the surface of the mentum to about its original depth.

EPICORDULIA, TETRAGONEURIA and **LIBELLULA.**

In contrast with Basiæschna, in which the development tends toward the disappearance of the teeth on both lateral lobe and ligula, stand the reprepresentatives of the Libullidæ, *Epicordulia princeps*, *Tetragoneuria cynosura*, and *Libellula pulchella*, in which the tendency throughout the nymphal life is to increase in complexity both lateral lobe and ligula. In the new hatched *Epicordulia* (Pl. II, Fig. 4) the ligula is comparatively simple. The center is marked by a slight depression between two slight elevations, while on either side is inserted a small spinule. Beneath these is a line, probably the indication of a former suture, and beneath that, six setigerous punctures. The second stage (Pl. II, Fig. 5) shows a number of teeth along the border of the ligula, while the two spinules have increased considerably in size and four smaller ones have developed, one above and one below the before mentioned suture, on either side of the center of the ligula. In the third stage (Pl. II, Fig. 6) the border of the ligula has become still more complicated, the number of teeth has increased, and below and in the notches between each pair of teeth is a spinule. These diminish in size from the center to the edges of the ligula. The six setigerous punctures have entirely disappeared.

The new-hatched ligula of *Tetragoneuria* (Pl. II, Fig. 7) shows almost exactly the same condition as the early stage of *Epicordulia*. The two spinules and the six irregularly placed setigerous punctures are present, but the teeth between the setæ are three in number and are not uniform in size. *Libellula pulchella* shows the six setigerous punctures placed some distance below the border of the mentum, but the spinules are absent and the border presents no distinctly defined teeth, but instead, in the exact center, are four small irregular elevations. The lateral lobes of *Libellula* and of *Epicordulia* are almost identical.

GOMPHUS.

The new-hatched *Gomphus spicatus* (Pl. II, Fig. 3) is worthy of notice especially with regard to the development of the teeth on the lateral lobe. Instead of having teeth on the upper end, as in *Libellulia* and *Epicordulia*, or on the inner edge, as in *Basiæschna*, they are placed all around the edge, giving an intermediate condition, from which the development might very easily go in either direction. No end hook is differentiated. The ligula shows four teeth in the center, with a spinule on either side, and finally a tooth on the outside of each spinule. The line immediately under the border of the ligula, which showed so plainly in *Epicordulia*, is less plainly marked.

III.—Homologies of Parts.

The most important paper upon the homologies of the parts of the labium, which has appeared up to this time, is "Zur Morphologie der Orthoptera Amphibotica," by A. Gerstaecker. In this Gerstaecker advances the theory that the ligula of the labium is formed by the fusion of the two laciniæ (inner laminæ), and that each lateral lobe consists of the fused palpus and galea. In support of this theory of the homologies of the parts of the labia and of the maxilla he offers the following evidence: the similarity in appearance, in the imago, of the movable hook of the lateral lobe and of the terminal joint of the palpus, the separation of the lateral lobe into two parts by a longitudinal suture and the different inclination of the surfaces of the two parts of it.

This assertion seemed to me to be based upon very insufficient evidence, especially in view of the fact that the suture which he mentions as dividing the lateral lobe into two parts seems to be entirely absent in such labia as have been examined in the course of this study. A wide superficial furrow is present, but with careful observation no suture could I detect. In another particular Gerstaecker's contention appears to me illogical, for, while he very truly contends that it is probable that in both maxilla and labium there has occurred a fusion of two parts, in the maxilla he believes the lacina and galea to be fused together, while in the labium he thinks that palpus and galea are fused together to form the lateral lobe, while the ligula represents merely the two laciniæ. Moreover, this theory of diverse fusions immediately follows an argument to prove the identity of the palpus in maxilla and labium, based on

the fact of their generally similar and parallel behavior throughout the Orthopteroidea.

In the course of my examination of adult labia I noticed a structure which seems hitherto to have been overlooked,—namely, the presence in certain Zygoptera of a distinct suture which, starting from the base of the cleft of the ligula, runs transversely to within a short distance of its border and, then turning backward, runs parallel with the border down to the mentum, as shown for *Euphœa masoni* in Plate VII, Fig. 6. The transverse portion of this line is bordered with hairs and, at the side nearest the cleft of the ligula it is produced into a point similar to that of the terminal border. In *Platycnemis acutipennis* (Pl. VII, Fig. 6 *b*) we have a similar condition, with the addition of the hairs within the suture, upon the lower part of the mentum.

The presence of this distinctly defined suture upon the mentum confirmed me in the opinion which, without much supporting evidence, is advanced by Rambur and Hagen, that the mentum is formed by the consolidation of two pairs of appendages of the maxilla, the lacinæ and galeæ, and that the lateral lobe represents the palpus alone. The foregoing examination of the labia of several species in embryonic stages corroborates this opinion. In the embryonic labium of *Lestes uncata* (Pl. V, Fig 13) it will be observed that the teeth in the cleft between the two halves of the developing mentum are forming in two sets, consisting of three teeth each, increasing in size from the bottom upward and already quite strongly chitinized. These may well be taken to represent the tip of the retarded laciniæ. Their sharp armature well corresponds with that of the tips of this chewing part of the maxilla. The paired lobes above these a short distance may well represent the tips of the retarded galeæ. In the embryonic labium of *Anax junius* (Pl. IV, Fig. 2) the separation between the two is marked by a deep indentation.

This theory then assumes that the lower sets of teeth represent the toothed borders of the lacinæ and the upper more or less crumpled lobes, the tips of the galeæ, while the lateral lobe represents the palpus above, much modified in shape and complicated by its change in function, In the development of the ligula the lacinæ consolidate and the lobes representing the galeæ grow together above them, inclosing them on all sides excepting at their juncture with the mentum. This theory gains force from the fact that in many of the

Orthoptera and Plectoptera a condition exists analogous to this of the embryonic stage. Notably in *Diaphemorera* and *Prisopus* we find the *laminæ externæ* slipping up over the lacinæ in such a manner as to partially surround them, much as is the case in the embryonic labium of *Anax*. It will further be observed that the lateral lobe articulates with a segment quite separate from that with which the ligula articulates, and that this piece seems in every way to correspond to the palpiger. From this evidence it seems reasonable to conclude that, in the so-called lateral lobe of the labium of the Odonata, we have represented merely the palpus of the typical maxilla, while the ligula represents the consolidated lacinæ and galeæ.

IV. Comparative Anatomy of Nymphal and Adult Labia by Groups.

The forms of the labia are exceedingly variable in the various families of the Odonata, both during the nymphal life and later after transformation. The variations in a single group are, however, comparatively slight, and each group can be adequately represented by a single typical specimen together with details from several of those showing the most marked differences.

Adult Labia.

LIBELLULIDÆ.

In the labia of adult Libellulidæ the average width of the combined mentum and ligula is 1.87 times its length, while the ligula is broadly rounded and without a median cleft. The lateral lobes are uniform, the proportion of length to width being as 1 to 1, they are deeply concave. The end of the lateral lobe is rounded and covered with hairs externally, and the movable hook is reduced to a very small and unarticulated rudiment. *Micrathyria berenice* (Pl. VII, Fig. 3) is typical of the adult Libellulid labium. In this group the chief variations are in condition of the movable hook and in the disposition of the hairs on the lateral lobe. In *Synthemis brevistyla* (Pl. VII, Fig. 3*d*) the movable hook is represented by a chitinized spot, while the hairs are sparse and are placed all around the border of the lateral lobe. Much the same condition exists in *Didymops transversa* (Pl. VII, fig. 3*b*), but the hairs appear on the surface of the lateral lobe, and there is a marked depression in the border of the lobe directly behind the chitinized spot, forming a small lobe in

front of the movable hook, a relic of the former articulation. *Cordulia shurtleffi* (Pl. VII, Fig. 3 *a*) has the hook wider and blunter, with the hairs very abundant. *Pseudophlebia minima* (Pl. VII, Fig. 3 *c*) is deeply chitinized along the inner border of the lateral lobe, and the hook is short and sharp. It differs from Micrathyria, however, in the absence of hairs on the surface of the lateral lobe. This group is much more specialized than any of the others, and is difficult of comparison, as the changes, especially in the lateral lobe, have almost obliterated the hooks.

ÆSCHNINÆ.

The Æschninæ present characteristics widely different from those just mentioned. The width of the mentum and ligula is usually 1.25 times its length, and the cleft, though ordinarily absent, is always indicated either by a slight depression in the center of the ligula or by the arrangement of the hairs along its border. Sometimes, however, a short but distinct apical cleft is present. The movable hook is well developed; it is short, thick, usually blunt and, upon the lateral lobes on either side of it, is developed a more or less well-defined angulation. Both lateral lobes and ligula are covered with numerous hairs. A very good representative of the group is *Gynacantha trifidia* (Pl. VII, Fig. 4). In *Coryphæschna ingens* (Pl. VII, Fig. 4 *a*) the movable hook is unusually large and the end hook is large and recurved. The ligula (Pl. VII, Fig. 4 *b*) shows a slight elevation in the middle of its border, with a short cleft in the center. In *Æschnophlebia anisoptera* (Pl. VII, Fig. 4 *c*) the end hook is large and clearly defined, but the lobe beside it is comparatively small. The lateral lobes of *Æschna constricta* (Pl. VII, Fig. 4 *d*) differ little from those of *Gynacantha*, but the ligula (Pl. VII, Fig. 4 *e*) shows a more marked depression in the middle of its front border. *Basiæschna janata* (Pl. VII, Fig. 4 *f*) shows the inner hook very strongly developed, while the lobe is almost absent.

GOMPHINÆ.

The Gomphinæ, belonging to the same family as the Æschninæ, have many points of similarity with them. The combined mentum and ligula is 1.4 as wide as it is long, and the cleft in the ligula is always absent. The lateral lobe (exclusive of end hook) is about 1.25 times as long as wide, and the movable hook is large and well developed.

The end hook is well developed, and of the outer lobe there is only occasionally a trace. *Ophiogomphus carolus* Pl. VII, Fig 5) shows these characteristics as well as any species. A profusion of hairs covers the entire labium, mentum, lateral lobes and all. In *Gomphus vulgatissima* (Pl. VII, Fig. 5 *a*) the movable hook is long and pointed, and the end hook also is of unusual length. The upper lobe is a mere protuberance on the border of the lateral lobe. The greatest development attained by the movable hook, however, is shown in *Aphylla edentata* (Pl. VII, Fig. 5 *b*), in which the movable hook is wonderfully long and slim, while the end hook almost equals it. The upper lobe has entirely disappeared.

Cordulegaster and **Tachopteryx.**

Cordulegaster maculatus and *Tachopteryx thoreyi* are the sole representatives of their respective subfamilies, which I have studied. *Cordulegaster* (Pl. VII, Fig. 1) shows a mentum cleft to about one-fourth its length. The cleft is wide and V shaped, and on either point a small tooth is developed. The surface and border of the mentum are covered with hairs. The lateral lobe is also thickly covered with hairs, the movable hook is short and blunt, while the end hook is long and sharp, and has a series of four small hooks developed along its inner edge (Pl. VII, Fig. 1 *a*). It will be shown further on that the end hook of *Calopteryx angustipennis* (Pl. VII, Fig. 6 *e*) exhibits one hook on its inner margin. These hooks, it seems to me, may not improbably be considered a development carried over from the nymphal condition.

Tachopteryx thoreyi (Pl. VII, Fig. 2) shows a ligula very similar to that of *Cordulegaster*. The mentum as well as the lateral lobe is thickly covered with hairs. The movable hook is large but blunt. and the end hook is short, slender and incurved.

ZYGOPTERA.

In the Agrionidæ the proportion of the width of the combined ligula and mentum to its length is as 1 : 1, and the cleft in the middle is always present. It varies in depth from .75 to .20 of the entire length and is proportionately wide. The existence of a suture across the ligula has already been mentioned, and this suture as well as the external border of the ligula is covered with hairs. The movable hook is usually blunt, the end hook is very often larger than the movable hook, while the outer lobe is not apparent. Both

the movable hook and the rest of the lateral lobe are covered with hairs. *Pseudophlea masoni* (Pl. VII, Fig. 6) is a good type of the family. In the lateral lobe of *Platycnemis acutipennis* (Pl. VII, Fig. 6 *a*) the development of the movable hook is proportionately greater, and both that and the end hook are strongly incurved. The mentum and ligula (Pl. VII, Fig. 6 *b*) differ a little from those of Euphea. In *Epiophlebia superstes* (Pl. VII, Fig. 6 *c* and *d*) the movable hook is largely developed, while the end hook is small and not very hook like in character. A slightly different type of end hook is shown in *Calopteryx angustipennis* (Pl. VII, Fig. 6 *e*); a small hook has developed upon its inner edge. In *Calopteryx maculatus* (Pl. VII, Fig. 6 *f*) the end hook is divided from the rest of the lateral lobe by a distinct suture. This suture is probably of secondary nature and importance.

Besides these labia which have been figured, I have also examined many others; but these show the greatest differences found. I have mounted and tabulated the characters of the labia of the following:

ANISOPTERA.

LIBELLULIDÆ.

Brachydiplax indica.....*Kirby.*
Brachythemis contaminata.....*Fabr.*
Cordulia shurtleffi.....*Scudder.*
Diastatops tincta.....*Rambur.*
Didymops transversa.....*Say.*
Hemicordulia tau.....*Selys*
Macromia illinoiensis.....*Walsh.*
Mesothemis simplicicollis.....*Say.*
Micrathyria berenice.....*Drury.*
Nannothemis bella.....*Uhler.*
Nephepeltia phyrne.....*Perty.*
Onychothemis abnormis.....*Brauer.*
Orthemis ferruginia.....*Fabr.*
Palpopleura sexmaculata.....*Fabr.*
Perithemis domitia.....*Drury.*
Plathemis lydia.....*Drury.*
Pseudophlebia minima.....*Kirby.*
Rhyothemis splendida.....*Rambur.*
Sympetrum corruptum.....*Hagen.*
Synthemis brevistyla.....*Selys.*
Tetragoneuria spinigera.....*Selys.*
Tramea lacerata.....*Hagen.*
Zygonyx iris.....*Selys.*

ÆSCHNIDÆ.

Æschninæ.

Æschna clepsydra.....*Say.*
Æschna constricta.....*Say.*
Æschnophlebia anisoptera.....*Selys.*
Basiæschna janata.....*Say.*
Coryphæschna ingens.....*Rambur.*
Epiæschna heros.....*Fabr.*
Gynacantha trifida.....*Rambur.*
Staurophlebia magnifica.....*Brauer.*

GOMPHINÆ.

Aphylla edentata.....*Selys.*
Epigomphus paludosus.....*Selys.*
Gomphidia confluens.....*Selys.*
Gomphoides stigmatus.....*Say.*
Gomphus exilis.....*Hagen.*
Hagenius brevistylus.....*Selys.*
Hemigomphus ochraceus.....*Selys.*
Ophiogomphus carolus.....*Needham.*
Progomphus obscurus.....*Rambur.*

CORDULEGASTERINÆ.

Cordulegaster maculatus.....*Selys.*

PETALURINÆ.

Tachopteryx thoreyi.....*Selys.*

ZYGOPTERA.

CALOPTERYGIDÆ.

Calopteryx angustipennis ..... *Selys.*
Calopteryx maculatus..... *Beauv.*
Cora inca ..... *Selys.*
Diphlebia lestoides ..... *Selys.*
Epiophlebia superstes ..... *Selys.*
Euphea masoni..... *Selys.*
Hetærina americana ..... *Fabr.*
Mnais strigata ..... *Selys.*
Neurobasis chinensis..... *Linne.*
Thore picta..... *Rambur.*

AGRIONIDÆ.

Archilestes grandis ..... *Selys.*
Argiolestes icteromelas ..... *Selys.*
Ceratula capreola..... *Hagen.*
Disparoneura vittata..... *Selys*
Hemicnemis bilineata..... *Selys.*
Heteragrion flavovittatum ..... *Selys.*
Mecistogaster sp. ?
Nesolestes alboterminata..... *Selys.*
Platycnemis acutipennis ..... *Selys.*
Protoneura capillaris..... *Rambur*
Pyrrhosoma nymphula ..... *Sulzer.*
Synlestes weyersi..... *Selys.*
Telebasis allaudi ..... *Martin.*
Xanthagrion erythroneurum .... *Selys.*

It will be observed that, with the exception of the Libellulidæ, in which the usual parts of the lateral lobe are almost unrecognizable, these adult labia are very similar. The chief differences are in the presence or absence of the cleft in the ligula and in its size and shape when present, in the shape and size of the movable hook and of the hooks on either side of it, and in the presence or absence of the hairs on the whole labium. The general contours are very similar, and the same parts are present in all the groups, the main differences being in the degree of fusion of parts.

Nymphal Labia.

In the consineration of the nymphal labia of the various groups, it will be well to observe the same sequence which was followed in treating of the adult labia. The Libellulidæ will therefore first engage our attention.

LIBELLULIDÆ.

In this family the nymphal labia are, upon the whole, somewhat more complicated than the adult labia. The mentum has much the same appearance and the ligula is, as a rule, rounded on its front border, as in the adult; but the lateral lobe is quite dissimilar. *Perithemis domitia* (Pl. VI, Fig. 5) is typical of the group. The lateral lobes are toothed along the ends, and near the outer edge appears a row of five setæ terminated by the strong, spine-like, movable hook. Two groups of nine setæ each appear midway down the mentum. The lateral lobe of *Tetragoneuria cynosura* (Pl. VI, Fig. 5 *h*) is very similar, with the exception of the fact

that in each of the teeth are inserted three small spinules, decreasing in size externally. *Phyllomacromia* sp.? (Pl. VI, Fig. 5 *d*) shows the teeth more strongly developed, the two uppermost ones sharply pointed, while the spinules inserted in the lower three are more numerous. The border of the ligula (Pl. VI, Fig. 5 *f*) is thickly covered with hairs, and is flatter than that of *Perithemis*. The lateral lobe of *Mesothemis simplicicollis* (Pl. VI, Fig. 5 *g*) resembles *Tetragoneuria*, although the teeth are obsolete and the number of setæ is greater. The ligula is like that of *Perithemis* in shape but more prominent, and is heavily bordered with hairs (Pl. VI, Fig. 5 *a*). *Epophthalmia elegans* is very different from the others of the group. The lateral lobe (Pl. VI, Fig. 5 *c*) is bordered with long, sharp, strongly incurved teeth, seven in number, and the setæ are entirely absent; while the ligula (Pl. VI, Fig. 5 *b*) has a deep cleft in the center, with a rounded protuberance on either side. The ligula of *Orthetrum cancellatum* (Pl. VI, Fig. 5 *e*) exhibits another variation; a slight elevation marks the center, while on either side are a number of small teeth with a small spinule between each pair.

ÆSCHININÆ.

The typical Æschninæ labium is well represented by *Basiæschna janata* (Pl. VI, Fig. 2). The ligula shows a shallow cleft, and its borders are thickly covered with hairs. The lateral lobes have a strong, sharply pointed, movable hook, while the end hook, although short, is stout and sharp. The inner edge of the lateral lobe bears a number of small chitinized spots, the witnesses of the existence of teeth in that position earlier in the nymphal life. *Æschna constricta* (Pl. VI, Fig. 2 *a*) shows a different type of end hook,—blunt, and straight across the end, with a small hook at the inner angle. In the lateral lobe of *Staurophlebia reticulata* (Pl. VI, Fig. 2 *b*) no traces of teeth are visible on the inner edge, and the end hook is short, but strongly incurved. The ligula of this specimen (Pl. VI, Fig. 2 *c*) has one very peculiar feature,—on either side of the central cleft is developed a long and slender spine. The border external to the spines is covered with short hair. The ligula of *Boyeria vinosa* (Pl. VI, Fig. 2 *d*) is characterized by a very small tooth on either side of the central cleft and at some distance from it. The border, on both sides of the teeth, is covered with hairs.

GOMPHINÆ.

The Gomphinæ labia differ comparatively little from those of Æschninæ. In a typical specimen, *Gomphus vulgatissimus* (Pl. VI, Fig. 1), the lateral lobes are perhaps larger in proportion to the mentum than is the case with the Æschninæ, but the general effect is very similar. The inner edges of the lateral lobes exhibit a series of six or eight small blunt teeth. The ligula is in this case entire, its margin perfectly straight, and covered with hairs. In *Phyllogomphus ethiops* (Pl. VI, Fig. 1 *a* and *e*) the teeth on the lateral lobe are more numerous and somewhat sharper than in the other, and the border of the ligula is V-shaped and covered with small spine-like teeth.

Gomphus dilatatus has the ligula (Pl. VI, Fig. 1*f*) concave and bordered with hairs. *Ophiogomphus severus* (Pl. VI, Fig. 1 *g* and *c*) shows a blunt end hook while the teeth on the inner margin of the lateral lobes are obsolete, and are represented by chitinized spots. *Aphylla* sp.? (Pl, VI, Fig. 1 *b*) has a slightly incurved end hook, while the teeth on the inner edge of the lateral lobe are four in number and are large and sharp. The ligula is slightly convex and bordered with hairs. An undescribed Gomphid from Brazil (Pl. VI, Fig. 1 *h*) exhibits a very singular end hook; it is quite long and rather sharp and bends abruptly downward toward the ligula, while the tip is again slightly elevated. The lateral lobe is quite devoid of teeth. The ligula of *Macrogomphus* sp.? (Pl. VI, Fig. 1 *d*) has a V shaped cleft in the center of the prominent ligula, and a sloping border on either side is covered with hairs.

CORDULEGASTER and TACHOPTERYX.

The labium of *Cordulegaster maculatus*, the lateral lobes of which are deeply concave, as in the Libellulidæ, exhibits a series of large triangular teeth along the distal edges of the lateral lobes. These teeth are sharp but very irregular in size: some of them are carried over into the adult stage. The movable hook is small in comparison with the rest of the lateral lobe. A series of five setæ appear just within the outer edge of each lobe. The ligula has in the center a marked elevation with a small cleft in it. The mentum has a group of about ten raptorial setæ on either side of the center.

Tachopteryx thoreyi shows a lateral lobe with a well developed movable hook but a very blunt end; the inner edge is covered with

minute teeth. The ligula and mentum are cleft to considerable depth, and on either side of the cleft is a small tooth flanked by a series of very minute ones. The line, indicating the base of the border of the ligula, which was observable in Lestes, is noticeable here also.

ZYGOPTERA.

Some very curious labia are to be found among the Zygoptera; they differ from the labia of the other groups, and vary greatly even from one another. No single species can be chosen as typical of the group, but they fall into four fairly well defined classes corresponding to the subfamilies of which nymphs are at present known.

Epallaginæ. *Bayadera indica* (Pl. V, Fig. 1) and *Libellago curta* (Pl. V, Fig. 2) present many points of similarity, both having a well developed hook, while *Bayadera* has two and *Libellago* three hooks beneath it, the lowermost of which is very blunt at the end. The inner edge of the lateral lobe is in each case bordered with very minute teeth. The margin of the ligula of each is convex and cleft, the cleft in the case of *Libellago* being much deeper. The border of the ligula is covered with very small teeth, and beneath are visible traces of an obsolete suture, bearing at either end a well defined tubercle. Below this line in *Bayadera*, on either side of the center of the mentum, are two setigerous punctures, homologous, perhaps, with the similar punctures on the labia of new hatched Libellulines. The lateral borders of the ligula are covered with hairs.

Vestalinæ (Calopterygin.e).—*Calopteryx maculatus* (Pl. V, Fig. 3), *Heterina americana* (Pl. V, Fig. 4), *Phaon* sp.? (Pl. V, Fig. 6), and *Neurobasis chinensis* (Pl. V, Fig. 5) are representatives of this group. They are very different from the members of the group just described. The lateral lobes in all four species are very narrow and show, underneath a very well developed movable hook, three long sharp hooks, varying slightly in size and shape in the different genera. In all four, one or more small spinules appear upon the lateral lobe just before the movable hook. A series of poorly developed teeth appear upon the inner edge of the lateral lobe in all except the *Phaon*. In *Heterina* and *Phaon* the cleft in the mentum is of moderate depth and oval in shape, but the ligula is so narrow and the width of the cleft is so great that the strip on either side is exceedingly narrow. A small seta appears on either side of the cleft about half way to the bottom. In *Calopteryx* and

Neurobasis the cleft is much deeper, extending far below the bases of the lateral lobes, and becoming lozenge shaped. The two small setæ are placed near the top. It seems very possible that these setæ may be land-marks indicating the situation of the sutural line, which has been mentioned so many times previously. In all excepting the *Phaon* the border of the ligula is covered with minute teeth.

Agrioninæ.—*Hyponeura lugens* (Pl. V, Figs. 7 and 8) offers a marked contrast to the members of the group above described. The lateral lobe is not very different, although only two hooks appear below the movable hook. There is a single seta on the lateral lobe. The ligula, however, is without a cleft and is covered across its entire border with small hairs. *Podagrion* sp.? (Pl. V, Fig. 9) exhibits a small cleft in the ligula, the lateral lobe is very similar to that of *Hyponeura*, but the seta is absent. The lateral lobe of *Enallagma doubledayi* (Pl. V, Fig. 10) shows between the movable hook and the end hook four small but clearly defined teeth. Five setæ appear along the outer edge.

Lestinæ.—From the lateral lobe of *Enallagma* to that of *Lestes uncata* (Pl. VII, Fig. 11) the transition is easy, especially in the light of the ontogeny of the latter. *Lestes* has a large, incurved end hook and above it, separated from it by a deep cleft, is a series of eight teeth; the two outer ones of this set are much larger and divaricate. The movable hook is well developed and bears two or three (generally three) large setæ, while one appears upon the lateral lobe just before the hook. The inner edge of the lateral lobe is bordered by a series of small teeth. *Archilestes grandis* (Pl. V, Fig. 12) has an end hook similar to that of *Lestes*, but between it and the movable hook appear only two large teeth. These are probably homologous with the two outer teeth of the set in *Lestes*. Two setæ appear on the movable hook and one large one, and two spinules on the lateral lobe immediately below it.

V. Marks of Specialization.

As is well known, the labium is formed by the fusion of two distinct appendages, the second maxillæ; and hence the most primitive form would be that which showed most clearly the parts of the original components. Now in this simple and primitive labium we should find a submentum, a mentum, a ligula in which the outer and inner laminæ were still distinct, and a three-jointed palpus with a well defined palpiger.

Of the various groups of labia which have been considered here, certain adult Zygoptera alone show the inner and outer laminæ separated by a distinct suture (Pl. VII, Figs. 6 and 9 *b*). As these species also exhibit a considerable cleft in the ligula, together with evidence that at one time this cleft extended to the base of the ligula; and as the movable hook on the lateral lobe still retains much of its palpus-like shape, it seems reasonable to conclude that in these species we have the most generalized and primitive of the labia of the Odonata.

The Gomphinæ and Æschninæ are considerably more specialized, having lost all trace of the suture dividing the inner from the outer laminæ, while the cleft, with the exception of a mere hint in one or two species, is absent in the entire family. The Libellulidæ are the most specialized of all, the mentum and ligula being completely consolidated without the slightest evidence of a cleft, and the lateral lobes having completely lost their palpus like character. It is from the greatly developed and hollowed out lateral lobes of this family that the comparison of the labium to a mask takes its origin.

The nymphal stages of *Neurobasis chinensis* and *Calopteryx maculata* (Pl. V, Figs. 3 and 5) show the ligula and mentum cleft to a remarkable depth. It has sometimes been inferred from this that in these species we find the most primitive type of labium; this theory is, however, rendered untenable by the fact that the depth of the cleft is much greater in the full-grown nymph, in proportion to its size, than in the earlier stages. It seems more probable, especially in view of the fact that greater specialization of labium always exists in the nymph than in the adult, that this unusual depth of cleft is simply a development to better adapt the nymph to its manner of life. Possibly this hole may be used as a place of disposal of rejected portions of its prey.

Anax junius and *Lestes uncata* are specialized along widely different lines. As already shown the tendency of *Lestes* through out its nymphal life is to the development of an increasing number of teeth on both lateral lobes and ligula, and to the devel opment of raptorial setæ on lateral lobe and mentum. In *Anax*, on the contrary, the tendency is toward greater simplicity; the number of teeth constantly diminishes; and it has heretofore been believed that no setæ were ever present. It will, however, be noticed that

in the early stages (Pl. IV, Figs. 3 and 4) two rudimentary setæ appear on the lateral lobe, just before the movable hook.

The Gomphinæ and Æschninæ are very similar in both nymphal and adult labial characters, and the affinities of *Tachopteryx* are clearly with these groups. The Libellulidæ have almost no points of resemblance to the other families, and appear very distinct. Cordulegaster is in many respects intermediate, the adult labium showing strong gomphine affinities, the nymphal labium being strikingly mask-like and Libelluline in form; but this latter may be the result of a parallelism and due to its manner of life.

Summary and Conclusion.

In conclusion it will be well to note the principal points which have been brought out in this discussion, and to give in a short space the essence of the conclusions reached.

Beginning with the discussion of the mechanism of the labium in the nymphal stage, it was observed that all movements which the labium executes are provided for by four pairs of muscles, which obtain the necessary leverage by pulling over two hinges. Two pairs of these muscles, the abductors and the adductors, are situated in the mentum, while the flexors and the extensors occupy the submentum.

In ontogenetic study observations were made upon the embryonic and early nymphal stages of *Lestes*, *Anax*, and *Basiæschna*. The remarkable similarity of the embryonic stages of *Anax* and *Lestes* was noticed, contrasting markedly with the divergence of their development during nymphal life. In these embryonic stages the retardation of development of the laminæ (galea and lacinia) in comparison with that of the palpus is clearly evident.

Finally, in a comparison of the adult and nymphal labia by groups, similarities and differences being carefully noted, there was brought out the fact of the great and independent specialization of the nymphal labia. They develop distinctive characters which are wholly absent in the adults of the same species.

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Plate II.

Fig. 1.—Dorsal view of muscles in the extended labium of the nymph of *Anax junius* Drury.

aa. Abductor muscle.
bb. Adductor muscle.
cc. Flexor muscle.
dd. Extensor muscle.
ll. Lateral lobe.
mh. Movable hook.
eh. End hook.
li. Ligula.
m. Mentum.
sm. Submentum.
e. Tentorium.
f. Hypo-pharynx.

Fig. 2.—Lateral view of same in closed labium.

aa. Abductor muscle.
bb. Adductor muscle.
cc. Flexor muscle.
dd. Extensor muscle.
e. Tentorium.
f. Hypo-pharynx.
g. Mouth.
h. Maxilla.
i. Mandible.
j. Labrum.
k. Lateral lobe.

Fig. 3.—Labium of new-hatched nymph of *Gomphus spicatus* Selys.
Fig. 4.—Labium of new-hatched nymph of *Epicordulia princeps* Hagen.
Fig. 5.—Ligula of same in the next succeeding stage.
Fig. 6.—The same in the next succeeding stage.
Fig. 7.—The same; in a new-hatched nymph of *Tetragonuria cynosura* Say.
Fig. 8.—Ligula and lateral lobe of new-hatched nymph of *Libellula pulchella* Drury.

Plate III.

Figs. 1–8.—A series of nymphal labia of *Lestes uncatus* Say, successive stages following hatching.

Plate IV.—Ontogeny in Æschninæ.

Figs. 1–2.—Embryonic labia of *Anax junius* Drury, at 17 and 20 days of incubation, respectively.
Figs. 3–4.—Nymphal labia of *Anax junius*, successive stages, following hatching.
Figs. 5–8.—Nymphal labia of *Basiæschna janata* Say, young stages.

Plate V.—Nymphal labia of Zygoptera.

Figs. 1–2.—Epallaginæ.
1. *Bayadera indica* Selys.
2. *Libellago curta* Selys.

Figs. 3–6.—Vestalinæ.
3. *Calopteryx maculata* Selys.
4. *Heterina americana* Fabr.
5. *Neurobasis chinensis* Linné.
6. *Phaon* sp. ?

Figs. 7–10.—Agrioninæ.
7. *Hyponeura lugens* Hagen, lateral lobe.
8. Apex of labium of the same.
9. *Podagrion* sp. ?
10. Lateral lobe of *Enallagma doubledayi* Selys.

Figs. 11–12.—Lestinæ.
11. *Lestes uncatus* Kirby.
12. *Archilestes grandis* Rambur.

Fig. 13.—Embryonic labium of *Lestes uncatus* Say.

PLATE VI.—Nymphal labia of Anisoptera.

Fig. 1.—Gomphinæ.
1. *Gomphus vulgatissimus* Linn.
a. Lateral lobe of *Phyllogomphus ethiops* Selys.
b. Lateral lobe of *Aphylla* sp. ?
c. Ligula of *Aphylla edentata* Selys.
d. Ligula of *Macrogomphus* sp. ?
e. Ligula of *Phyllogomphus ethiops*.
f. Ligula of *Gomphus dilatatus* Selys.
g. Lateral lobe of *Ophiogomphus severus* Hagen.
h. Ligula of an unknown Gomphidæ from Brazil.

Fig. 2.—Æschninæ.
2. *Basiæschna janata* Say.
a. Lateral lobe of *Æschna clepsydra* Say.
b. Lateral lobe of *Staurophlebia magnifica* Brauer.
c. Ligula of *Staurophlebia magnifica* Brauer.
d. Ligula of *Boyeria vinosa* Say.

Fig. 3.—*Tachopteryx thoreyi* Selys.

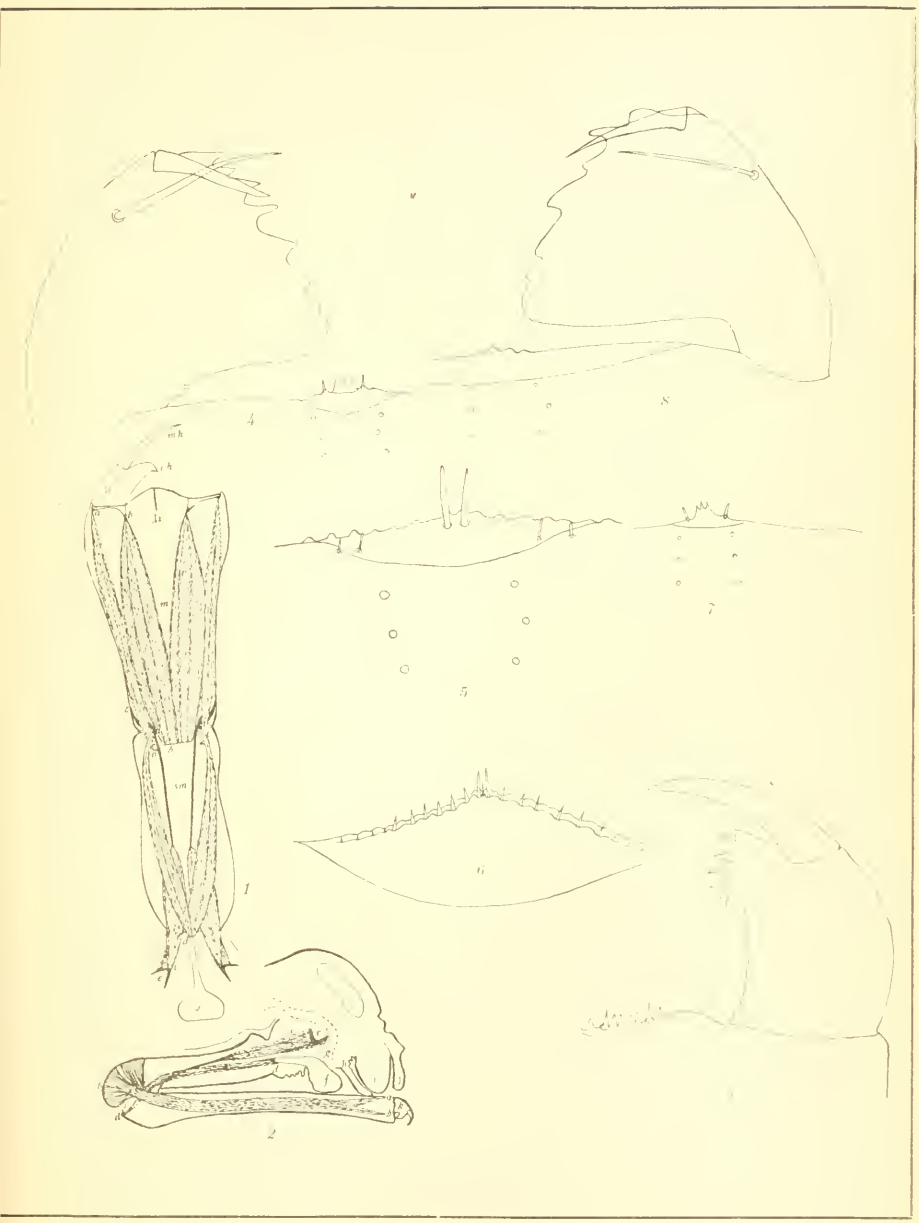
Fig. 4.—*Cordulegaster maculatus* Selys.

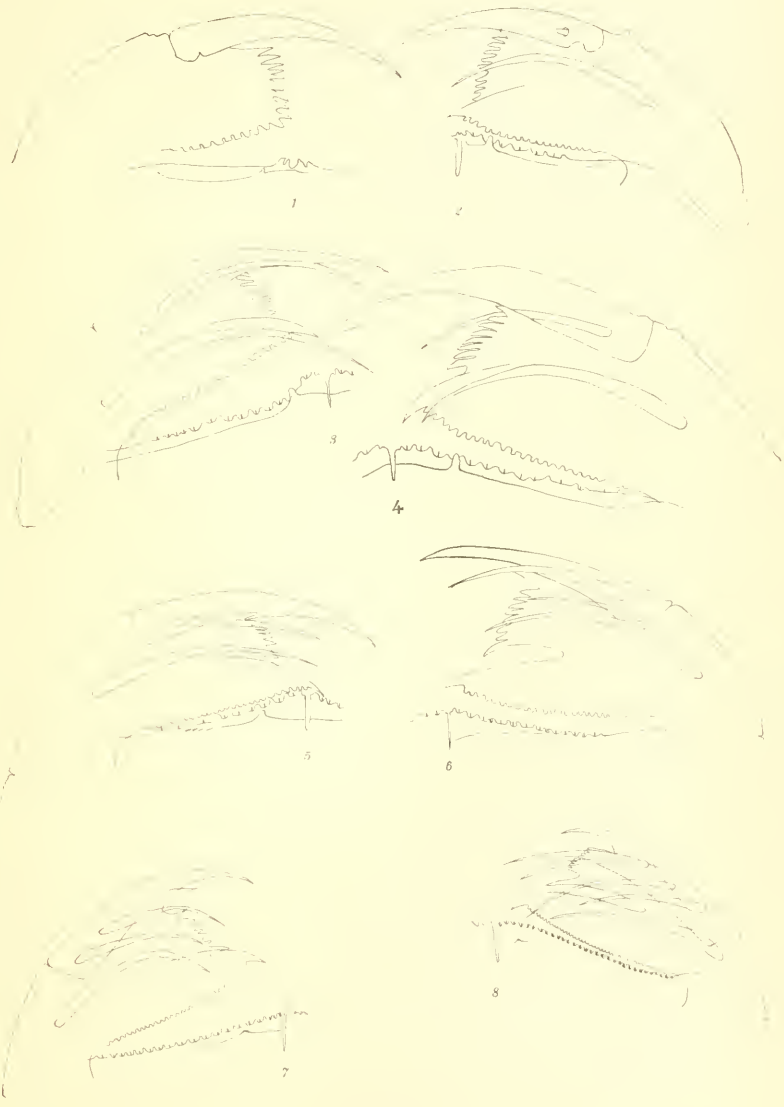
Fig. 5.—Libellulinæ.
5. *Perithemis domitia* Drury.
a. Ligula of *Mesothemis simplicollis* Say.
b. Ligula of *Epopthalmia elegans* Brauer.
c. Lateral lobe of *Epopthalmia elegans* Brauer.
d. Lateral lobe of *Phyllomacromia* sp. ?
e. Ligula of *Orthetrum cancellatum* Linné.
f. Ligula of *Phyllomacromia* sp.
g. Lateral lobe of *Mesothemis simplicollis* Say.
h. Lateral lobe of *Tetragoneuria cynosura* Say.

PLATE VII.—Adult labia.

Fig. 1.—Labium of *Cordulegaster maculatus* Selys.
a. Enlarged end hook of same.

Fig. 2.—*Tachopteryx thoreyi* Selys.

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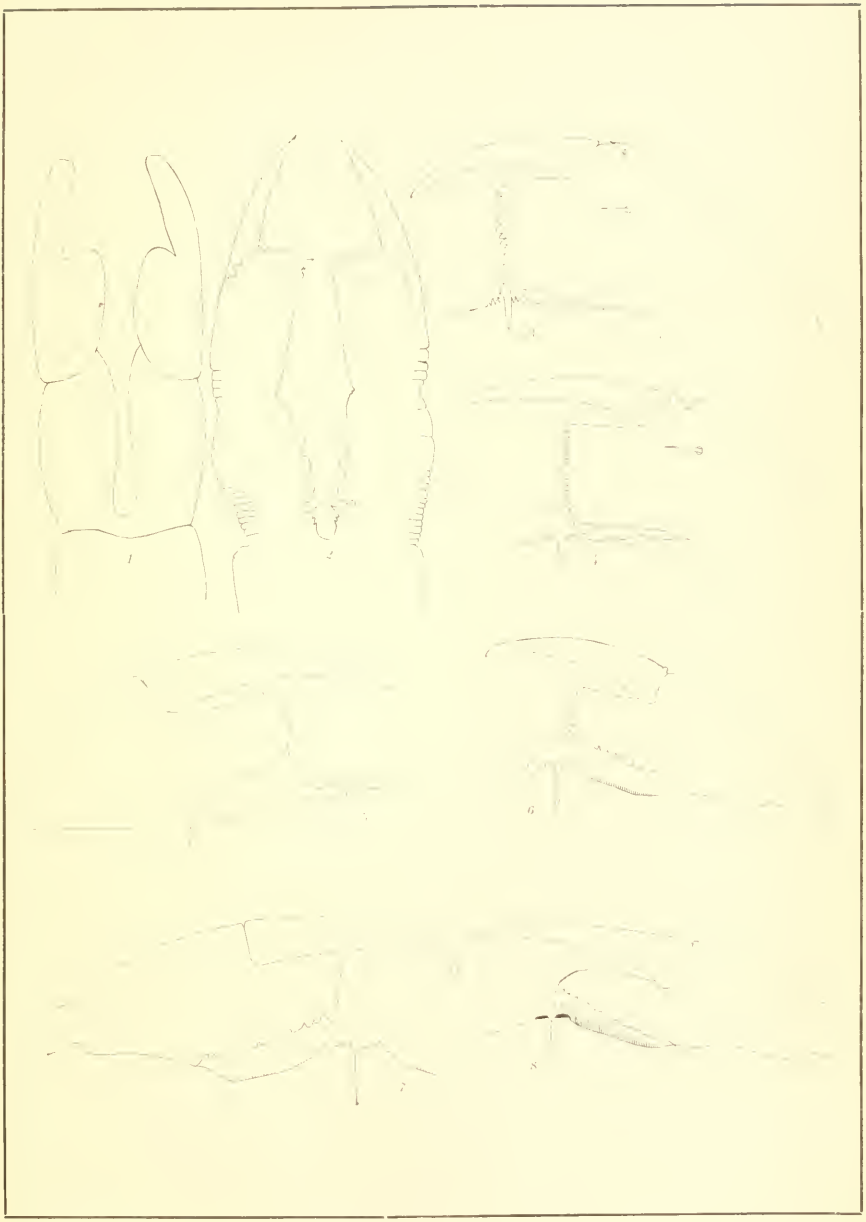

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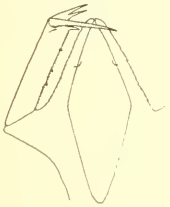

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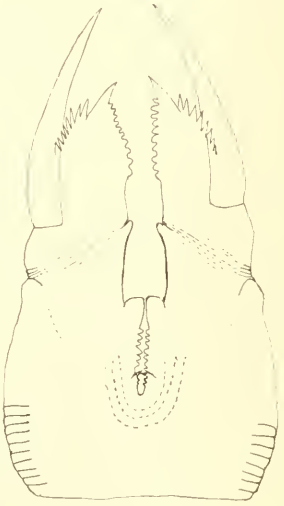

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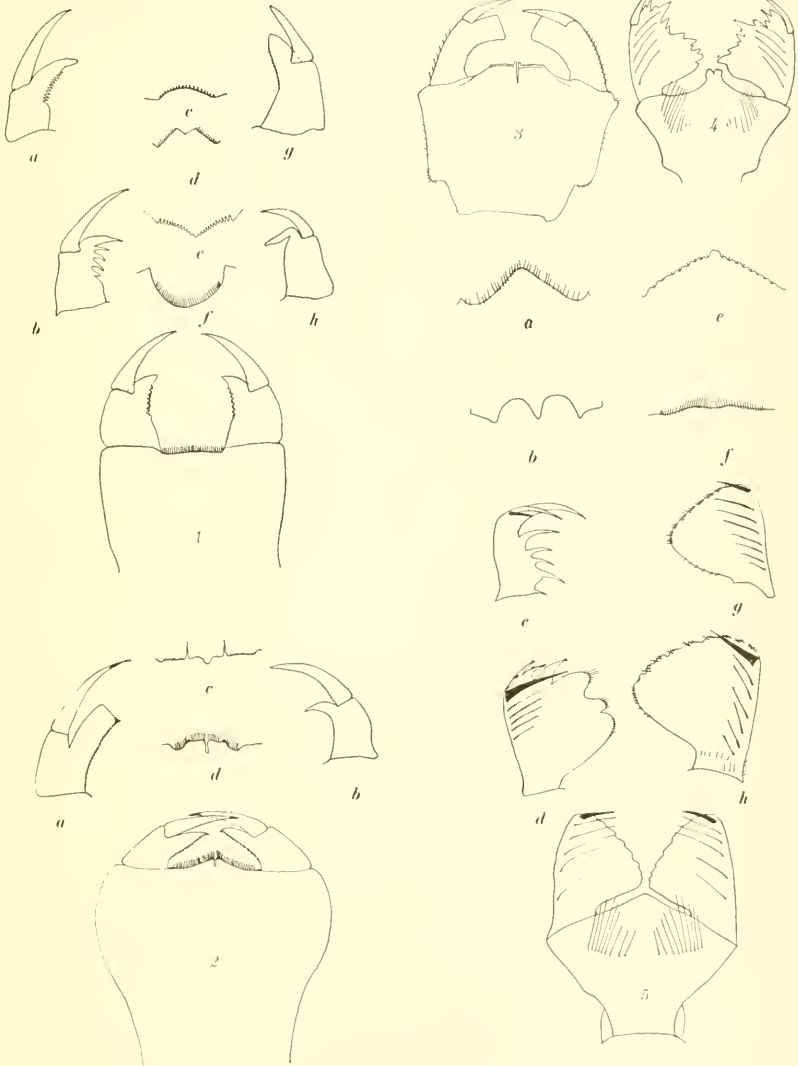
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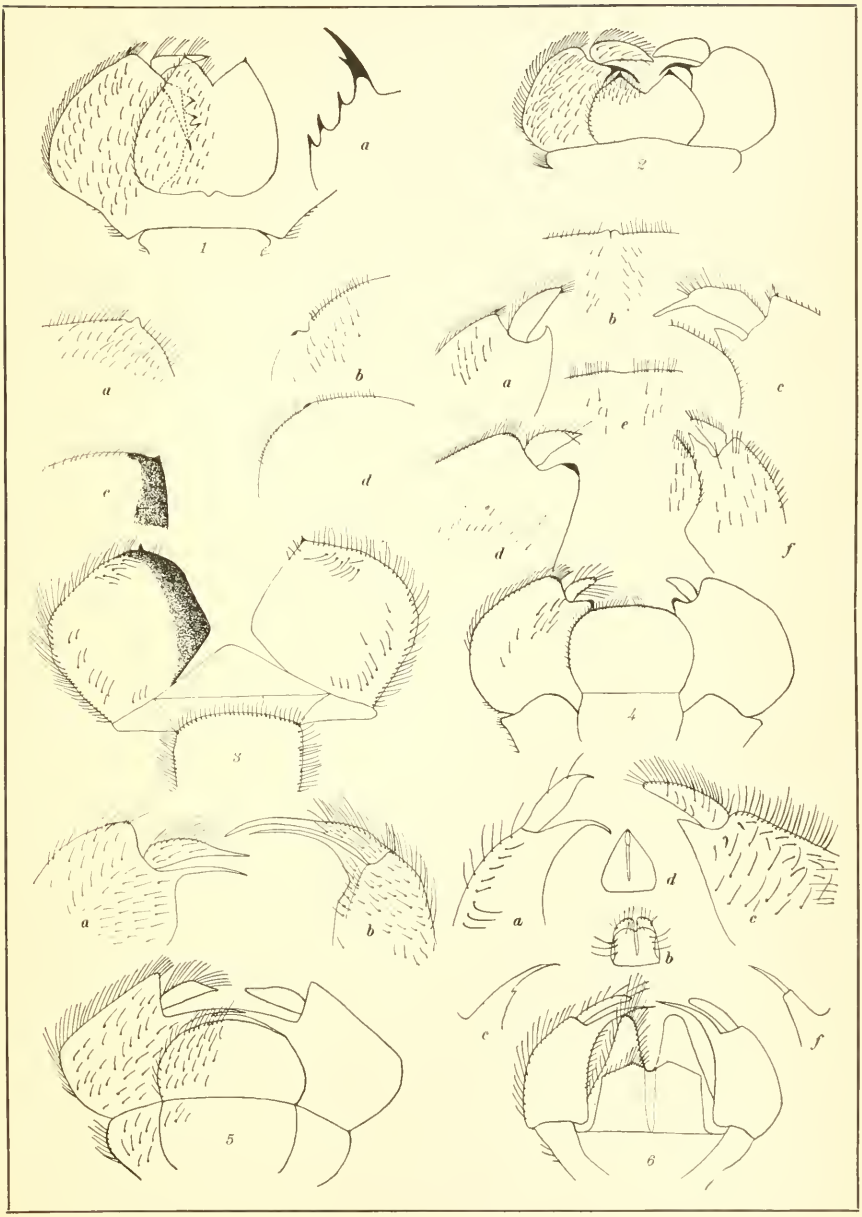
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Fig. 3.—Libellulidæ.

3. *Micrathyria berenice* Drury.

a. Tip of lateral lobe of *Cordulia shurtleffi* Scudder.

b. Tip of lateral lobe of *Didymops transversa* Say.

c. Tip of lateral lobe of *Pseudophlebia minima* Kirby.

d. Tip of lateral lobe of *Synthemis brevistyla* Selys.

Fig. 4.—Æschninæ.

4. *Gynacantha trifida* Rambur.

a. Lateral lobe of *Coryphæschna ingens* Rambur–Selys.

b. Ligula of same

c. Lateral lobe of *Æschnophlebia anisoptera* Selys.

d. Lateral lobe of *Æschna constricta* Say.

e. Ligula of same.

f. Lateral lobe of *Basiæschna janata* Say.

Fig. 5.—Gomphinæ.

2. *Ophiogomphus carolus* Needham.

a. Lateral lobe of *Gomphus vulgatissimus* Linné.

b. Lateral lobe of *Aphylla edentata* Selys.

Fig. 6.—Zygoptera.

6. *Pseudophea masoni* Selys.

a. Lateral lobe of *Platycnemis acutipennis* Selys.

b. Ligula of same.

c. Lateral lobe of *Epiophlebia superstes* Selys.

d. Ligula of same.

e. End hook of lateral lobe of *Calopteryx angustipennis* Walker.

f. End hook of lateral lobe of *Calopteryx maculata* Beauvois.

BIBLIOGRAPHY.

1883, Brulle, P.—Observations sur la bouche des Libellulines. Ann. Soc. Ent. France, vol. ii, p. 343–350, pl. 13.

1842, Rambur, P.—Historie Naturelle des Insectes. Neuropteres, Paris, pl. 1, figs. 1 and 3.

1869, Brandt, A.—Beitraege zur Entwicklungsgeschichte der Libelluliden und Hemipteren, mit besondere Berucksichtigung der Embryonalhülle derselben. Memoires L'Academie Imperiale des Sciences de St. Petersbourg. 7 Series, Tome 13, No. 1.

1873, Gerstaecker, A.—Zur Morphologie der Orthoptera amphibiotica. Festschrift hundert jahr Best. Gesell. Naturfor. Freunde. Berlin, pp. 39–59, pl. 1.

1883, Packard, A. S.—The Systematic Position of the Orthoptera in Relation to other Orders of Insects. Third Report of the U. S. Ent. Comm. Pl. 37.

1893, Calvert, P. P.—Catalogue of the Odonata of Philadelphia and Vicinity. Tr. Am. Ent. Soc., vol xx, pp. 155–158, pl. 2, figs. 7–10.

1896, Heymons, R.—Grundzüge der Entwickelung und des Körperbaues von Odonaten und Ephemeriden. Anh. Abh. Kgl. Preuss. Akad. der Wiss. zu Berlin. Pp. 17–26, pl. 2, figs. 17, 19, 21, 24.

1901, Needham, J. G.—Aquatic Insects in the Adirondacks. Bulletin 47, N. Y. State Museum.

1902, Comstock, J. H.—Skeleton of the Head of Insects. American Naturalist. Vol. 36, No. 421.

NEW SPECIES OF AMERICAN HETEROCERA.

BY W. SCHAUS.

SYNTOMIDÆ.

Homœocera rhodocera.—Antennæ red, tipped with yellow. Legs black; tarsi red. Palpi black, streaked with blue below. Head and thorax black, some blue scales on collar. Abdomen black; a metallic lilacine dorsal and lateral line; a transverse yellow line on first segment; a lateral white spot and yellow line on second segment; a white ventral spot. A white tuft at base of hind legs. Wings transparent yellowish, tinged with brown along costa of primaries; veins black except 10, 11, 12, which are reddish; fringe dark brown; outer margin of secondaries near angle blackish. Expanse 38 mm.

Habitat.—Chiriqui.

Sarosa meridensis.—Legs black, streaked with blue; tarsi fawn colored; fore coxæ opalescent. Head and thorax black; a blue spot on head and on tegula. Abdomen black; transverse yellow band on first and second segments; dorsal lilacine spots; a lateral yellow spot on segment 2; lateral white ventral spots on segments 2, 3, 4. Primaries yellowish hyaline; veins black; space between costal and subcostal veins light brownish, and a similar shade at base of inner margin; inner and outer margins, and fringe narrowly black, apex broadly black. Secondaries whitish hyaline; the costa yellowish; the outer margin narrowly black. Antennæ black; broadly yellow before tips. Expanse 35 mm.

Habitat.—Merida, Venezuela.

Æthria innotata.—Body black; a few blue scales on collar; anal tuft crimson. Wings transparent, veins black. Primaries: the margins black, the outer margin more broadly so, especially at apex and inner angle; the discocellular broadly black. Secondaries with the outer margin very broadly black. Expanse 38 mm.

Habitat.—Petropolis, Brazil.

Macrocneme viridifusa.—Head and thorax greenish black; tegulæ outwardly and inwardly edged with white. Abdomen dull green; two white spots laterally at base; a white ventral spot; trochanters spotted with white. Legs greenish black. Primaries brownish black; the veins dark green, also the costal and inner margins. Expanse 36 mm.

Habitat.—Castro, Parana.

Cyanopepla samarca.—Palpi black above, white below. Body above bright blue; abdomen with a subdorsal and lateral whitish line, below the lateral line a broad black band; ventrally white; legs black, outwardly streaked with white; fore coxæ white. Primaries black; a large carmine space from base to close to outer margin; this space is straight along costal and inner margins,

truncate from end of cell anteriorly to outer margin; some bright blue at base. Secondaries black, with a broad carmine streak from base to outer margin; some white at base of crimson streak. Expanse 25 mm.

Habitat.—Bolivia.

The sexes similar in size and markings. This species is closely allied to *C. phœnicea* Hampson.

Eucereon cubensis.—Head and thorax olivaceous grey; the markings black, edged with olivaceous fawn; a lateral streak on palpi; a spot on head; two spots on collar; streaks on thorax and patagiæ. Abdomen dorsally black, laterally and on last three segments dorsally yellow, two black dorsal spots, and a black transverse line on anal segment; underneath white; some lateral black spots. Primaries whitish grey; the veins, costa, and inner margin olive green; elongated black spots in cell and between the veins; four on costa, and a streak at apex; one in middle and two at end of cell; two below cell, at, and near base; three on inner margin, and four above submedian vein; three below vein 2, and also between the other veins to vein 7; two spots between veins 7 and 8. Secondaries white; the veins outwardly and outer margin blackish. Expanse 38 mm.

Habitat.—Matanzas, Cuba.

Eucereon irrorata.—Palpi and frons whitish. Head posteriorly, collar and thorax light brown; a white streak from base of antennæ to base of costa of primaries. Abdomen light brown basally, dark grey posteriorly. Legs grey, hind tibiæ and tarsi whitish. Primaries brown, thinly irrorated with black, forming a vague outer transverse shade and terminal streaks; a black discal point. Secondaries dark grey, paler at base. Expanse 21 mm.

Habitat.—Alto Cedro, Cuba.

Neacerea nigra.—Body black; a blue spot behind head. Abdomen with transverse yellow bands, chiefly noticeable laterally, being concealed dorsally by the long tufts of black scales. Primaries black; a blue spot at base. Secondaries thinly scaled, whitish at base, otherwise black. Expanse 38 mm.

Habitat.—Chiriqui.

Dahana cubana.—Antennæ black. Palpi black, red at base. Head below and laterally red; frons dark blue. Collar dark blue. Thorax black; a dark-blue streak on patagiæ. Abdomen blue; the last two segments crimson, this color extending dorsally toward base. Legs black streaked with grey. Primaries black; some metallic blue streaks at base. Secondaries bright blue, the apex and outer margin black. Underneath the primaries have the basal two-thirds blue. Expanse 28 mm.

Habitat.—Tanamo, Cuba.

Correbidia apicalis.—Antennæ black. Palpi black, ochreous at base. Frons black. Head posteriorly, collar and thorax ochreous witha dark central line. Abdomen black above and ventrally, laterally broadly ochreous. Primaries bright ochreous; a broad blue-black spot just before middle from close

below costal vein to submedian vein; an elongated blue-black spot at apex; the inner margin and lower veins tinged with orange. Secondaries thinly scaled, yellowish; the apex and outer margin near anal angle clouded with black. Expanse 25 mm.

Habitat.—Baracoa, Cuba.

Ctenucha annulata.—Palpi black. Frons white. Head and thorax bright metallic blue. Abdomen black, shaded with blue at base; transverse yellow lines dorsally, white lines ventrally. Legs grey, mottled with white. Wings black, shot with bright metallic blue on basal half. Primaries: a broad, oblique, orange band from just below middle of costa to near inner margin close to angle. Secondaries: an orange outer shade, irrorated with black from costa to vein 3. Underneath similar, but the blue partly replaced by light grey. Expanse 28 mm.

Habitat.—Bolivia.

ARCTIIDÆ.

Elysius barnesi.—♀. Body white. Abdomen dorsally pale ochreous, except base, and last two segments; fore tibiæ outwardly ochreous. Wings white. Expanse 54 mm.

Habitat.—Matanzas, Cuba.

Elysius systron.—Head and thorax dark brown; some yellow scales near end of palpi; a yellow line behind head and tegulæ. Abdomen black, with broad, yellow, transverse bands dorsally, divided into two spots on last segment. Primaries dark brown; a cream-colored spot below vein 2; a few cream-colored scales above vein 5, near cell; a minute whitish point above vein 5, and another above vein 6, near the outer margin. Secondaries greyish, thickly irrorated with brown scales, especially at apex and along outer margin. Underneath similar, but duller. Expanse 45 mm.

Habitat.—Castro, Parana.

HYPIDOTA gen. nov.

Palpi short, porrect, not reaching vertex. Antennæ pectinated to tips. Wings long, narrow; outer margins oblique. Primaries—vein 3 further from 2 than from 4; 4 and 5 on short stalk; 6 from upper angle; 8 and 9 stalked on 7; 10 from near end of cell. Secondaries—3 and 4 from lower angle; 5 absent; 6 and 7 from upper angle; 8 from before end of cell.

This genus is near *Thalesa* Schaus.

Hypidota neurias.—Palpi outwardly blackish. Head, collar, thorax and primaries pale buff, veins darker. Abdomen ochreous above, white underneath; basal segment and secondaries whitish. Expanse 38 mm.

Habitat.—Castro, Parana.

Halisidota grotei ♂.—Body fawn colored; two black points behind head; a black point on patagia; lateral black rings on abdomen; legs spotted at joints. Wings fawn color. Primaries with very irregular black irrorations and lines, forming a darker inner and outer band, the former bifurcated on costa. Secondaries with an irregular subterminal black band.

♀.—Similar, paler, the irrorations on primaries forming more even, fine, transverse lines about twelve in number, and not suffusing as in the ♂. Secondaries with a dark discal point, and the marginal dark band still more distinct. Below similar. Expanse, ♂, 32 mm; ♀ 39 mm.

Habitat.—Tanamo, Cuba.

Halisidota tanamo.—♂. Palpi whitish. Head and thorax yellowish fawn color. Abdomen ochreous above, cream color below. Legs cream color, partly streaked with ochreous. Primaries yellowish fawn color, with traces of slightly darker lines; a broad inner and narrower outer band, formed by contiguous lines, being most noticeable. Secondaries semi-transparent, yellow-white, with some slightly darker hairs at anal angle. No markings underneath. Expanse 38 mm.

Habitat.—Tanamo, Cuba.

Virbia rotundata.—Body black; a yellow line behind head; some triangular yellow spots laterally on abdomen. Primaries olivaceous black. Secondaries black; a large round yellow spot at apex. Underneath duller black; on primary a large yellow spot narrow and pointed towards base, expanding beyond cell. Yellow spot on secondaries as above. Expanse 32 mm.

Habitat.—Castro, Parana.

Antaretia pallidivena.—♂. Antennæ with the stem dark brown, the pectinations ochreous brown. Head and collar dark brown. Thorax pale buff. Abdomen ochreous. Primaries buff; the veins white; some ochreous scales on inner margin. Underneath whitish, the costal margins and outer margin of primaries pale brown. Expanse 32 mm.

Habitat.—Castro, Parana.

HYPSISDÆ.

Eucyane gundlachia.—Palpi black, ochreous at base. Body metallic blue; last three segments of abdomen and ventrally to near base ochreous; throat, fore coxæ and base of legs ochreous. Primaries green-blue. Secondaries brilliant metallic blue, darkest on outer half. Fringe whitish. Expanse 45 mm.

Habitat.—Rio Cano, Cuba.

This species is quite similar to *Napata chalybea* Hübn., except in neuration.

MEGALOPYGIDÆ.

Altha maculata.—♂. Body and wings silvery white; pectinations of antennæ black; some blackish hairs on fore legs. An outer row of reddish brown spots on veins 2–5 of primaries. Expanse 14 mm.

Habitat.—Santiago, Cuba.

Megalopyge govana.—Head cream color, frons brown. Collar and thorax brown, the latter with a white tuft posteriorly. Abdomen paler brown Wings brown, paler on the outer margin and towards apex; some darker and longer scales in and below cell; a wavy outer white shade, and an oblique white shade from cell at vein 2 to outer shade; a fine whitish streak in cell. Secondaries pale fawn color; the veins and a shade below the cell brownish Expanse 31 mm.

Habitat.—British Guiana.

Megalopyge aricia.—Body golden brown. Tarsi black. Primaries grey; the basal half with undulating darker scales; an indistinct quadrate spot in cell; an indistinct subterminal whitish shade; a terminal dark line; fringe dark grey. Secondaries whitish; the veins and fringe grey; some light brown hairs on inner margin. Expanse 35 mm.

Habitat.—Aroa, Venezuela.

Megalopyge nigrescens.—♂. Body black; anal tuft whitish; tarsi tipped with whitish. Wings somewhat diaphanous, being thinly scaled. Primaries black; apex broadly pale buff; a subapical dark point; a wavy pale subterminal line on dark portion from vein 4 to inner margin. Secondaries black; fringe and outer margin pale buff.

♀. Similar, but the scales on primaries more crenulate; the secondaries with the apical third of wing pale buff. Expanse, ♂, 23 mm.; ♀ 29 mm.

Habitat.—British Guiana; Merida, Venezuela.

GERONTIA gen. nov.

Antennæ pectinated to tips. Palpi very minute. Tibiæ and tarsi hairy. Primaries: costa straight; outer margin slightly oblique; inner margin convex; submedian vein bifurcating; 2 and 4 equally distant from 3; 5 from just above lower angle of cell; 6 from upper angle; 8, 9, 10 stalked on 7; 11 from near end of cell. Secondaries with costal and outer margins rounded; veins 2, 3, 4, 5 about equally distant from each other; 6 from middle of discocellular; 7 and 8 anastomizing to end of cell, then bifurcating.

Gerontia omayena.—Head, thorax and primaries grey, the veins very dark. Abdomen and secondaries dark fawn color. Expanse 40 mm.

Habitat.—Omai, British Guiana.

THOSCORA gen. nov.

Antennæ pectinated to tips. Palpi minute. Tibiæ and tarsi very hairy. Costal margin straight; outer margin oblique; inner margin slightly convex. Submedian vein bifurcating. Veins 2, 3, 4 equally distant; 5 from lower angle with 4; 6 from just above mid-

dle of discocellular; 8 and 10 stalked with 7; 9 stalked with 8. Secondaries: costal margin slightly round; apex not rounded; a greater space between veins 2 and 3, than between 3 and 4, and 4 and 5; 6 nearer 5 than 7; 7 from upper angle of cell; 8 bifurcating just before end of cell.

Thoscora brugea.—Head and abdomen ochreous. Antennæ, thorax and anal tuft greyish brown. Primaries similar, the veins darker. Secondaries more greyish. Expanse 40 mm.

Habitat.—Aroa, Venezuela.

LIPARIDÆ.

TROCHUDA gen nov.

Legs hairy. Palpi hairy, reaching frons. Antennæ deeply pectinated to tips. Primaries broad; the outer margin convex towards apex; outer margin nearly straight. Veins 2, 3, 4 equally distant; 5 from close to 4; 6 from upper angle of cell; 7 also from upper angle; 8 and 9 stalked together on 7; 10 also from 7. Secondaries: costal margin straight; outer margin rounded; 3, 4, 5 from lower angle of cell; 6 and 7 from upper angle of cell; 8 diverging from 7 before middle of cell.

Trochuda bilinea.—Frons and antennæ pale brown. Thorax dark grey. Abdomen fawn color. Wings white. Primaries: the veins grey, two transverse grey bands, the inner one from middle of costa to inner margin near base, the outer line from costa near apex to middle of inner margin; fringe grey. Secondaries with the veins slightly greyish. Expanse 37 mm.

Habitat.—Omai, British Guiana.

LASIOCAMPIDÆ.

SPHINTA gen. nov.

Antennæ pectinated to tips. Legs hairy. Wings long and narrow. Primaries: costal margin straight, outer margin obliquely rounded; veins 4 and 5 from lower angle of cell; 6, 7, 8 stalked from upper angle of cell; 9 and 10 stalked from just before upper angle of cell; 11 from middle of cell. Secondaries: convex at base, then straight; cell short anteriorly, then oblique and longer posteriorly; veins 3, 4, 5 close together at lower angle; 6 from upper angle; 7 and 8 anostomosing near base, then diverging immediately.

Sphinta cossoides.—Body dark grey, mottled with brown hairs. Primaries: the costal margin dark grey; the base and inner margin brownish grey;

a dark shade below cell from base to vein 4, then broken into spots to near apex; beyond cell and on outer margin the wing is whitish; another row of brownish grey spots below and parallel to this shade. Secondaries whitish grey; some indistinct subterminal spots between the veins. Expanse 40 mm.

Habitat.—Sao Paulo; Castro, Parana.

SATURNIIDÆ.

Automeris pygmæa.—♂. Body ochreous fawn color, darkest on thorax. Primaries roseate fawn color; the basal half of costa grey; a grey discal point containing some black scales; a straight grey line from costa near apex to inner margin close to angle. Secondaries similar in color, with the discal space paler; eye spot pink and red, with a black point, and circled with black. Underneath: a black discal point on primaries, and the eye spot on secondaries faintly visible. Expanse 33 mm.

Habitat.—Castro, Parana.

PEROPHORIDÆ.

Perophora bilinea.—♂. Light grayish brown. Head and collar with some reddish brown scales. Wings thinly irrorated with black; fringe blackish; a terminal roseate line. Primaries: the costa finely roseate; a fine black straight inner line; a similar outer line slightly angled at vein 5; a black discal point. Secondaries with a fine black median line. Expanse 36 mm.

Habitat.—Castro, Parana.

CERATOCAMPIDÆ.

Othorene rubra.—♂. Head, collar, patagiæ and body below lilacine grey. Thorax and abdomen above reddish brown. Primaries reddish brown; the outer margin from apex to inner margin at two-thirds from base lilacine grey; an indistinct basal greyish shade; a white discal spot. Secondaries deep red, darkest about anal angle. Underneath: primaries greyish; a dark line from apex; the costal margin shaded with violaceous; the inner margin to cell bright red; a few blackish irrorations. Secondaries lilacine grey, some black irrorations; a red streak in inner margin; a dark line at apex. Expanse 112 mm.

Habitat.—British Guiana.

Othorene carisma.—♂. Body above ochreous fawn color; the patagiæ inwardly bordered with dark grey. Abdomen above similar, shaded with lilacine laterally and underneath. Wings ochreous fawn color. Primaries: some dark irrorations; inner margin finely lilacine grey; an inner fine, dark, straight line; a fine outer line from costa close to apex to middle of inner margin; outer margin shaded with lilacine; a white discal spot darkly circled and surmounted by a dark point. Secondaries: inner margin broadly shaded with red; a dark apical shade. Underneath: primaries reddish ochreous; a dark violaceous outer line beyond which the outer margin is tinged with lilacine. Secondaries lilacine, darkest in costal margin; a dark streak from apex; some dark irrorations on costal margin.

♀. Head, thorax and primaries ochreous brown; the lines on patagiæ as in ♂. Primaries finely irrorated with black; the lines as in ♂. Two small black discal points. Secondaries reddish; a dark median transverse line. Underneath lilacine grey, irrorated with black; the inner margins yellowish; an outer line on primaries; a median line on secondaries not reaching the inner margin. Expanse, ♂, 63 mm.; ♀ 96 mm.

Habitat.—British Guiana.

Othorene subochreata.—Head and abdomen above ochreous brown. Thorax dull brown. Abdomen below lilacine. Primaries dull brown, somewhat darker about apex and with a faint dark line from costa before apex to middle of inner margin; a large white spot at base; a white spot on middle of inner margin, and another below vein 2; a faint ochreous brown discal spot. Secondaries brown, with dark-red hairs from base almost to outer margin; some ochreous hairs on inner margin. Underneath: primaries ochreous brown; the apex and outer margin dull lilacine brown; a faint trace of dark outer line from vein 4 to costa. Secondaries dull lilacine brown; the inner margin broadly ochreous. Expanse 70 mm.

Habitat.—British Guiana.

Adelocephala citrina.—Head and thorax pale yellow; some reddish hairs below head and on fore legs. Abdomen white. Primaries pale yellow; a fine darker line from apex to just beyond middle of inner margin, a faint inner line; a whitish discal spot. Secondaries pale yellow, whitish at base. Expanse 38 mm.

Habitat.—Castro, Parana.

COSSIDÆ.

Cossus tropicalis.—♀. Head, collar and patagiæ pale buff. Abdomen dorsally buff, laterally blackish, underneath white. Primaries whitish grey, shaded with light brown along the inner margin, and from the costal margin across the median space to inner angle; some black reticulations, chiefly on outer half of wing; an irregular narrow black line from the costa at four-fifths from base to above the inner engle; an indistinct buff spot at end of cell. Secondaries greyish black; the outer margin narrowly buff, with a few black striæ. Underneath: much suffused with black. Expanse 63 mm.

Habitat.—Omai, British Guiana.

A specimen of this species is in the British Museum from Mexico.

NOTODONTIDÆ.

Nystalea kayei.—Palpi fawn color, mottled with grey. Head and collar fawn color. Thorax mottled grey and brown. Abdomen brown above; basal and lateral tufts creamy fawn; underneath and also long tufts on legs cream color. Primaries grey, mottled with brownish and black scales; a black transverse spot just beyond middle of cell, followed by a transverse brown line edged with black; a similar line crosses beyond the cell, and both are very indistinct in the general mottling; the outer line followed by a geminate row of whitish

points on the veins; a small black spot below origin of vein 2; a large irregular spot at end of cell outlined with dark grey; a subterminal, wavy, black line most heavily marked at inner angle, and preceded at costa by a pale buff space on which is a conspicuous velvety black streak; fringe buff spotted with brown. Secondaries whitish at base, dull brownish black on outer half. Expanse 53 mm.

Habitat.—Rockstone, British Guiana.

I am indebted to Mr. W. J. Kaye for this specimen which he caught.

Nystalea guttulata.—Head and collar cream color, mottled with reddish brown. Thorax brown; patagiæ grey. Abdomen light-reddish brown above; a black subdorsal spot near base. Primaries: base pale grey, followed by a geminate dark line filled in with grey, and then by a dark greyish-brown space extending almost to middle of wing and outwardly crossed by a pale grey line; median space pale grey, darkest on inner margin, and including a large cell spot irregularly outlined with velvety black, which is closely followed by a transverse dark line, widest on the inner margin, and this is also followed by a fine straighter reddish brown line; terminal space buffish grey, inwardly limited by a dark geminate line filled in with dark grey; an irregular row of reddish brown spots; a subterminal row of black points above and below each vein; a terminal row of larger dark brown spots; fringe grey, spotted with brown. Secondaries: basal half whitish; outer half black; fringe whitish. Expanse 43 mm.

Habitat.—Baracoa, Cuba.

Nystalea malga.—Head pale buff; palpi mottled with brown. Collar and thorax light brown. Abdomen darker brown dorsally, buff ventrally. Primaries light, brown; a broad dark-brown shade from base to outer margin between veins 4 and 7, and three terminal black streaks between these veins; two cell spots outlined with light brown, very indistinct; traces of dark geminate lines on costa; the outer line also visible to inner margin; subterminal and terminal dark lines. Secondaries whitish; veins and outer margin dark brown; fringe buff. Expanse 54 mm.

Habitat.—Rio Janeiro.

Nystalea corrusca.—Palpi, head and thorax dark grey mottled with buff. Abdomen reddish brown dorsally, dark grey on last segment; underneath fawn color. Primaries: basal third buff, with longitudinal dark grey streaks; a large triangular black space at base of costa; veins irrorated with black and buff scales; a round velvety black cell spot preceded by a black dash; outer portion of wing brown suffused with dark grey; from costa, at three-fourths from base, a broad greyish-black band to outer margin between veins 4–7; a smaller blackish space on costa before apex; outer line oblique, dentate, indistinct, heavily shaded with dark brown and grey; a subterminal, interrupted, velvety black line; fringe mottled black and buff, tips of veins buff. Secondaries whitish buff; veins and outer margin blackish; fringe toward apex and on inner margin buff. Expanse, 62 mm.

Habitat.—Rio Janeiro.

Eragisa viridis.—Palpi laterally buff. Head and thorax pale green. Primaries pale green, thinly irrorated with black scales; a white discal point; lines very fine, black; inner line wavy; outer line oblique from costa at two-thirds from base, then wavy to inner angle. Secondaries brownish black, paler on costal margin. Expanse, 48 mm.

Habitat.—Rio Janeiro.

Eragisa? sabulosa.—♀. Head and thorax mottled grey and brown. Abdomen grey above, yellowish underneath and with yellowish basal tufts dorsally. Primaries olivaceous grey; an obliquely curved, blackish, geminate, basal line; an indistinct geminate inner line chiefly noticeable on costa; cell spot fine, outlined with whitish, preceded by an olivaceous spot extending below cell, and followed by a large round black spot mottled with reddish brown; several geminate streaks on costa; the outer line geminate, dentate, with dark and light points on veins, heavily shaded with black and olivaceous on costa, and followed by another dark patch on costa before apex; a faint subterminal whitish line shaded with olivaceous at vein 5; a terminal row of dark spots. Secondaries brown; base and outer margin yellowish; a geminate dark streak at anal angle. Expanse 60 mm.

Habitat.—Chiriqui.

Poresta cossoides.—Palpi and tuft dark lilacine grey; frons reddish brown. Collar and thorax brownish; patagiæ buff. Abdomen light brown. Primaries: base below costa and inner margin buff with three fine pale reddish brown lines; an elongated narrow buff space on costal margin just beyond middle; otherwise the wing is dark brown shaded with olivaceous on median space, and on the outer space with lilacine; traces of a curved outer line; on outer margin a small silver spot below vein 2, and a larger one above it, both edged with blackish brown; above these spots traces of an interrupted dark line; a terminal black line; fringe light brown. Secondaries dark brown, paler at base; fringe buff. Expanse 46 mm.

Habitat.—Omai, British Guiana.

Lepasta omaiensis.—Palpi brownish grey. Head brown, mottled with grey posteriorly. Collar grey and brown; a black patch anteriorly. Thorax grey; a brown line on patagiæ. Primaries: costa pale olivaceous mottled with black and white; four small white spots before apex; subcostal posteriorly shaded with black and white, cell otherwise pale olivaceous; black streaks at base below median vein; inner margin darkish grey; some black scales on submedian vein; traces of a median and an outer roseate white transverse line, connected by a broad dash of roseate about vein 5; otherwise the intermediate space filled in with pale olivaceous, mottled with black; this is followed by a series of black streaks between the veins, forming a black shade toward the costal margin; the outer margin broadly grey; the subterminal line wavy, black, heavily shaded inwardly with dark olivaceous; some darker mottlings on outer margin; an interrupted dark terminal line; fringe olivaceous toward apex, grey near inner angle. Secondaries greyish brown on basal half, dark brown outwardly; fringe grey and brown. Expanse 30 mm.

Habitat.—Omai, British Guiana.

Arhacia meridionalis.—Head and thorax dark brown; a pale streak on patagiæ, and a large pale spot on thorax posteriorly. Abdomen dull black above; a brighter black subdorsal spot at base; underneath and anal hairs buff. Primaries olivaceous brown, darkest along costa; some brownish shades on costa, in and below cell; a basal and an inner very dentate, interrupted, black line; inner margin, except basal fourth, narrowly reddish brown, partly edged with black; cell spot large, pale olivaceous and reddish brown containing an irregular buff streak, and edged with buff, preceded by a darker shade in cell, and followed by a buff space to near outer margin; this pale space containing a fine line twice very deeply dentate; below this traces of a geminate outer line; outer margin light reddish brown, inwardly edged with buff and cut by an interrupted black line; a terminal black line; fringe reddish brown spotted with buff. Secondaries greyish black; a geminate, black, terminal line; some black and buff spots at anal angle. Expanse 80 mm.

Habitat.—British Guiana.

Arhacia fascis Schs.—In my revision of the American Notodontidæ I followed Mr. Druce who, in the Biologia, sank this species as a synonym of *combusta* H. S. I find, however, on examining more material, that *combusta* ♀ has the antennæ simple, whereas in *fascis* ♀ they are almost as strongly pectinated as in the ♂. This is also the case in *A. meridionalis.*

Misogada pallida.—Antennæ light brown. Palpi grey; outwardly black. Head white. Collar and thorax whitish with a few brown hairs. Abdomen brown above, white underneath. Primaries olivaceous white, markings reddish brown; a dentate inner line, slightly oblique outwardly from costa to inner margin, where it is followed by a few black scales; a fine lunular line at end of cell slightly mottled with black; a wavy outer line further removed from apex than from inner angle; a terminal row of spots between the veins; fringe white. Secondaries whitish thinly covered with brown scales; the outer margin more evenly brown; fringe brown tipped with white. Expanse 34 mm.

Habitat.—Santiago, Cuba.

Heterocampa baracoana.—♀. Head and collar green. Patagiæ white. Abdomen dark grey. Primaries dark green; traces of an inner brownish shade; a large white space from end of cell to apex, crossed by a few darker streaks and shaded with green on costa at apex; this space is inwardly straight from vein 2 to costa, outwardly irregular, being incurved about vein 4, this leaving the outer margin green to apex. Secondaries grey; basal two-thirds of costal margin brown green; apex whitish; faint traces of a dark outer line. Expanse 40 mm.

Habitat.—Baracoa, Cuba.

Heterocampa santiago.—♂. Head and palpi fawn color, the latter outwardly velvety brown. Thorax and abdomen dark gray. Primaries steel grey; a fine black and buff basal line; the inner line geminate, diverging in cell, parallel, lunular below cell, the outer portion fine black, the inner portion olivaceous brown less distinct; an olivaceous shade below cell connecting basal and

inner lines; a fine black median line forming a curve from vein 6 to vein 3 and then another curve to inner margin, the space between this and inner line being whitish, with some angular olivaceous streaks on costa; the outer line fine geminate, irregular, partly followed by some reddish brown and olivaceous shades; a subterminal reddish brown line; the outer margin olivaceous; a fine terminal black line; fine black streaks on veins before the subterminal. Secondaries white; the inner and costal margins brown; a terminal brown shade on outer margin. Expanse 37 mm.

Habitat.—Santiago, Cuba.

Heterocampa sylvia.—Head dull olivaceous. Thorax dark brown mottled with white. Abdomen dull brown, mottled at base with olivaceous brown, at anal segment with grey. Primaries white, irrorated with grey and olivaceous scales; a dark grey spot near base in cell and a larger one below it to inner margin, heavily shaded on either side by olivaceous brown; an irregular median brown shade angled at end of cell. An outer geminate row of black clusters of scales on veins, partly shaded with olivaceous brown, a dark space before apex on costa; a vague subterminal grey shade; black terminal streaks on veins, and some olivaceous brown scales between. Secondaries whitish, faintly shaded with black at apex and along margins. Expanse 35 mm.

Habitat.—Castro, Parana.

Heterocampa albidiscata.—♀. Palpi and abdomen brown. Collar and thorax dark grey. Primaries white, irrorated with brown scales, leaving a large quadrate discal spot and a broad subterminal shade white, the latter most conspicuous towards the costal margin; a narrow terminal brown band preceded by a white line and crossed by white veins. Secondaries light brown, thinly scaled, and darkest on outer margin; base of fringe dark brown. Expanse 50 mm.

Habitat.—Tanamo, Cuba.

Heterocampa barensa.—Palpi black, fringed with fawn color. Frons fawn color. Collar reddish brown. Thorax dark green. Abdomen above dark grey, with basal green tuft; underneath white. Primaries: base and inner margin dark green; basal and irregular inner black lines; a whitish spot at end of cell; apical portion greyish, mottled with green, forming indistinct subterminal and terminal spots; traces of a dark lunular and geminate outer line, also of a dentate median line. Secondaries white; the costal margin narrowly green; some dark scales at anal angle. Expanse 40 mm.

Habitat.—Castro, Parana.

Malocampa ecpantherioides.—Head and thorax lilacine brown, mottled with grey hairs; blackish transverse line on tegulæ. Abdomen dark grey above with some narrow yellow transverse lines; laterally yellow on basal half; underneath whitish; lilacine hairs in anal tuft. Primaries brown; geminate sub-basal, basal, inner and outer lines, broken in spots by the veins, black filled in with lilacine scales; cell spot black, edged with lilacine; two dark median spots on costa; an irregular subterminal row of dark spots mottled with lilacine scales; outer margin grey, cut by the lighter brown veins, the grey edged

on either side with black and lilacine. Secondaries brown; the base and inner margin yellow. Expanse 56 mm.

Habitat.—Omai, British Guiana.

Rifargia picta.—♂. Palpi and head buff. Collar violaceous brown. Thorax grey. Abdomen subdorsally grey, laterally brown, ventrally buff. Primaries: a broad white streak from base for four-fifths, anteriorly edged with black, posteriorly shaded with olivaceous; below this the inner margin is violaceous brown, mottled with grey; a fine black streak on submedian; the extreme inner margin buff, divided by a black line; the white streak is broadly shaded anteriorly with violaceous brown; costal margin reddish brown; a large pale outer space above vein 3, interrupted by a broad dark grey streak beyond cell, edged above and below by a black line, the posterior line shaded below with olivaceous; outer margin narrowly grey, cut by pale veins and edged by buff lines, and inwardly also with black; cell spot greyish, irregular, bordered by a grey line finely edged with black, toothed towards base, and prolonged outwardly to vein 6; the portion towards base forms an outward curve towards the white streak. Secondaries whitish; veins brown; a terminal dark brown line; brown shadings on inner margin; a dark brown spot at anal angle.

♀. Head, collar and thorax reddish brown; patagiæ dark grey. Primaries: a short white streak at base below median; inner margin violaceous brown below submedian, olivaceous above it; dark streaks on submedian and extreme inner margin; costal margin from one-fourth to apex broadly dark violaceous brown and containing the two black lines beyond cell above veins 4 and 5; from basal fourth of costa a pale violaceous space extends to outer margin, which becomes darker posteriorly; an outer lunular, fine, geminate line curves and connects with the two prolongations of discal spot; outer margin darker than in the ♂. Secondaries brown; blackish along outer margin; a fine subterminal buff line; fringe buff. Expanse ♂ 47 mm.; ♀ 46 mm.

Habitat.—Omai, British Guiana.

Rifargia guianensis.—Head and thorax mottled dark brown and white. Abdomen dark brown above, white underneath. Primaries silvery white; markings and irrorations dark brown; a small triangular space on costal margin near base, and a larger similar space occupying the inner margin, and crossed by a velvety black dentate and oblique line; five spots on costa between middle and apex; a fine median line partly geminate, and both followed and preceded by irrorations; an outer velvety line, lunular above inner margin to vein 4; followed by some velvety streaks most noticeable towards costa where they are shaded with brown; a subterminal lunular line, and a fine terminal line; fringe grey and brown. Secondaries white, broadly dark brown on inner margin; outer margin and costa narrowly dark brown; veins partly brown. Expanse 29 mm.

Habitat.—Omai, British Guiana.

Hemiceras moresca.—♀. Body brown, the patagiæ tinged with lilacine; some white hairs between antennæ. Primaries brown, tinged with lilacine along inner margin, costa and beyond outer line; lines paler, shaded with

darker brown towards median space; the inner line slightly curved on costa then straight to inner margin and marked with a black spot on subcostal vein; the outer line from costa at four-fifths to inner margin at two-thirds; discal spot large, dark, oblique and not very distinct. Secondaries whitish, the veins and outer margin light brown. Expanse 35 mm.

Habitat.—Omai, British Guiana.

Hemiceras truncata.—♂. Palpi, head and collar reddish brown; a white spot between antennæ. Thorax ochreous brown. Patagiæ violaceous brown. Abdomen greyish black above, roseate fawn color below. Primaries with the apex truncated, the outer and inner margins evenly rounded, dark glossy brown; costal margin black; a transverse streak at base; inner line dark grey, oblique from costa to submedian then curved, followed on inner margin by a reddish brown shade outwardly edged with dark grey; discal spot large, oblong, oblique, reddish brown; the outer line replaced by a curved row of dark points on veins followed by an olivaceous brown, rather indistinct shade at veins 3 and 4; a broad dark shade from costa near apex to vein 5, preceded by a fine blackish streak parallel to it. Secondaries dark brown, whitish in disc; a dark glandular patch at vein 2 and outer margin. Expanse 50 mm.

Habitat.—Omai, British Guiana.

Hemiceras angulinea.—♀. Head and thorax brown mottled with lilacine scales. Abdomen brownish above, whitish below. Primaries lilacine brown, the veins irrorated with dark brown and buff scales; a dark, wavy, basal line; the inner line irregular, outwardly curved on median, inwardly angled on submedian, buff outwardly shaded with dark brown below the median vein; a dark shade at end of cell; outer line buff, inwardly shaded with darker brown, and strongly angled at vein 5; indistinct dark subterminal spot between the veins. Secondaries whitish, shaded with brown on outer margin. Expanse 40 mm.

Habitat.—Bolivia.

Hapigia raatzi Mosch.

On my revision of the Notodontidæ I placed *H. ribbei* Druce as a synonym of this species. I have now more specimens of *H. raatzi*, and find they all have the outer line below vein 2, inwardly angled. I have specimens with and without the silver spots which seem of no specific value in this genus, and I must therefore put *H. ribbei* as a synonym of *H. simplex* Walk.

Hapigia directa.—Palpi, head and thorax violaceous brown; some buff hairs behind head. Abdomen dull brown above, reddish brown below; anal hairs buff. Primaries reddish brown; indistinct traces of a basal and an inner transverse wavy grey line; a large oblique kidney-shaped silver cell spot finely edged with black, and containing some reddish brown scales; this spot inwardly

surmounted by a round silver spot on subcostal vein; the outer line greyish, outwardly edged with black, inwardly oblique from costa to vein 2, then slightly wavy to inner margin; an irregular subterminal row of black marks, the apical spot inwardly shaded with white; fringe the same color as wing. Secondaries duller reddish brown; long pale buff hairs on inner margin; fringe dark grey at base, terminally pale buff. Expanse 56 mm.

Habitat.—Cuba.

In many specimens the silver spots are absent.

Hapigia curvilinea.—Head, collar, thorax dark reddish brown; some dark grey scales behind head. Abdomen blackish grey above; basal buff tufts; underneath buff; a ventral patch of reddish brown scales and similar tufts on legs. Primaries very dark reddish brown, especially at base, on, and above inner margin and along outer margin; blackish shades on costa and basal third of wing; a bright light brown spot below cell near base, and a dash of the same color between 2 and 3; some buff hairs at base of inner margin; inner line indistinct black; a large silver cell spot constricted, containing an irregular golden line edged with reddish scales; a small round silver spot on subcostal before the cell spot, and this also contains reddish and golden scales; outer line dark grey outwardly shaded with black; this line outwardly curved from costa to below vein 2, then forming another slight curve to inner margin; outer space shaded with lilacine and crossed by indistinct greyish shades; terminal blackish spots between the veins; a large silver spot at apex, shaded with golden and mottled with red scales. Secondaries dark grey. Expanse 67 mm.

Habitat.—British Guiana.

Hapigia plateada.—Palpi violaceous brown. Collar dark violaceous brown. Thorax lilacine brown. Abdomen buff, shaded with grey subdorsally, and with a darker basal tuft. Primaries bright brown; costa finely blackish; a fine black interrupted basal line; the inner line fine, lunular below cell, from costa at one-fourth to middle of inner margin, preceded above and below submedian by a dark mark; a large black spot below vein 2, and a black dash beyond cell spot; the silver cell spot very large irregularly triangular, the anterior inner portion separated by a fine line, and the larger portion containing some reddish lines; the outer line fine darker brown, indistinct, slightly curved from costa to below vein 2; some indistinct subterminal black marks; apex black, preceded by a large irregular silvery spot. Secondaries yellowish white. Expanse 63 mm.

Habitat.—British Guiana.

Owing to the large cell spot this resembles strongly the species of *Chliara*.

Chliara notha Mosch.

Having recently received this species from British Guiana, I find it should be removed to *Hapigia*, and it is, I think, only a strongly marked form of *smerinthoides* Wlk.

NOCTUIDÆ.

Prodenia marima.—Head and thorax mottled buff and dark brown. Abdomen greyish brown. Primaries dark brown; a buff streak on base of subcostal; a buff streak on median shortly bifurcating on veins 3 and 4; a buff streak on basal third of vein 2; an oblique buff basal streak from costa to submedian; an inwardly oblique buff streak from subcostal to submedian partly shaded with velvety brown, and divided below median by a dark line; orbicular outwardly oblique from subcostal, buff, containing a grey streak, and shaded with darker brown on either side; reniform inwardly oblique from subcostal, partly outlined with buff; traces of a geminate dark outer line, filled in with buff on inner margin; a broad subterminal buff shade divided by a dark line, and preceded by black streaks between the veins; fringe buff, divided by a dark line. Secondaries white; some brown scales along costa. Expanse 30 mm.

Habitat.—Castro, Parana.

Fagitana niveigutta.—Head, thorax and primaries dark lilacine brown. Abdomen dark brown. Primaries: orbicular round, consisting of a fine reddish brown circle; reniform larger, outlined with reddish brown and containing posteriorly a pure white spot; a fine dark line from costa near apex to middle of inner margin, beyond which the wing is a trifle more lilacine; a fine subterminal wavy reddish brown line. Secondaries dull brown. Expanse 37 mm.

Habitat.—Castro, Parana.

Fagitana marginata.—Head and thorax reddish brown, the scales tipped with grey. Primaries reddish brown, thickly irrorated with greyish scales, the outer margin especially being broadly and evenly tinted with grey; the inner and outer lines fine, very indistinct; orbicular and reniform narrow, greyish like the outer margin; fringe dark, tipped with pale grey. Secondaries blackish brown; slightly whitish at base; fringe light grey. Expanse 36 mm.

Habitat.—Castro, Parana.

Euthisanotia magnifica.—Head black, with some yellow scales. Collar dark red. Thorax reddish brown, both mottled with white and yellow scales. Abdomen black; a yellow streak laterally at base. Primaries maroon, irrorated with pale bluish green scales; a basal white line; a broad wavy inner white band; orbicular and reniform black, separated by some white scales; a broad white space beyond cell from costa to vein 3, bulging outwardly at vein 6, and below vein 4, and crossed from vein 7 by a parallel maroon line; a broad white band below reniform, from vein 2 to inner margin; outer margin white, crossed by a lunular maroon shade; a terminal black line; fringe black and white alternately. Secondaries yellow; the costal and outer margins very broadly black; inner margin narrowly black; a black streak across end of cell; some terminal yellow spots; fringe white, spotted with black. Expanse 48 mm.

Habitat.—Petropolis, Brazil.

Cydosia punctistriga.—Body black. White spots on palpi, frons, collar, patagiæ and thorax; also ventrally on abdomen and on legs; anal tuft

orange. Primaries brown-black; a line of white spots through the cell to outer margin below apex, consisting of a small geminate spot at base, followed by a streak, then two round spots, a quadrate spot, a round spot, an oblong spot, and two geminate smaller spots; some red streaks on costal margins; a transverse reddish inner line, and a vague similar outer line above the inner margin. Secondaries black. Underneath black, without markings. Expanse 27 mm.

Habitat.—Castro, Parana.

Bryophila algama.—Head, collar and patagiæ black. Thorax white. Abdomen greyish. Primaries black, mottled with buff on median space, chiefly on margins; outer margin broadly buff, shaded with brown; a whitish inner band, followed in cell by a large white spot mottled with light brown; outer line buff on costal and inner margins; an interrupted dark terminal line; fringe grey. Secondaries brownish grey, darkest on outer margin; a dark discal point and faint outer line. Expanse 23 mm.

Habitat.—Castro, Parana.

Microcœlia parigana.—♀. Head and thorax mottled grey and brown. Primaries grey, irrorated with dark brown scales; base of costa dark brown; a faint white basal line; inner line white indentate above submedian; spots large outlined with white, and containing olive-brown lines; a white lunule below orbicular; a very dark brown median band; outer line geminate, filled in with white on costa and inner margins, slightly incurved below reniform and then inwardly shaded with olive brown; a dark brown spot between reniform and outer line; a fine, dentate, white subterminal line partly shaded with lilacine and dark brown; outer margin olive-brown; an interrupted dark terminal line; fringe spotted with black. Secondaries brownish; a dark discal point, a pale outer line; a terminal dark line. Expanse 23 mm.

Habitat.—Castro, Parana.

Microcœlia farona.—♂. Head and thorax grey, mottled with buff and brown. Abdomen buff, irrorated with black scales. Primaries brown; buff spots on outer half of costa; base mottled with buff; inner line olive-brown, followed by a lilacine space suffusing with the whitish orbicular, which contains an olivaceous spot; reniform large, white, divided by an olive brown line; some lilacine scales; an irregular buff band from apex to inner margin suffusing with the outer line from vein 6 to inner margin; outer line oblique, geminate from costa to vein 6; a dark marginal spot between veins 4 and 6; a wavy white line on outer margin below vein 4 to inner angle; fringe brown, spotted with white. Secondaries whitish buff, thickly irrorated with brown scales; traces of an outer line, and a marginal shade. Expanse 30 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Microcœlia mastera.—Palpi and thorax grey. Head white. Abdomen grey, with transverse dark streaks subdorsally. Primaries whitish; inner margin, between spots, before and below orbicular, and beyond and below reniform steel grey; some black at base; costa spotted with black; spots mottled with olivaceous, and partly outlined with black; outer line black; outer margin mottled

with grey and olivaceous, leaving the subterminal white; terminal black spots: fringe grey and olivaceous. Secondaries grayish brown; a dark discal spot; a dark outer line; an interrupted dark terminal shade. Expanse 27 mm.

Habitat.—Castro, Parana.

Thyatira godalma.—Palpi brown. Head, collar and thorax pale fawn color; a dark grey spot posteriorly on thorax; patagiæ posteriorly brown. Primaries: base very dark brown, crossed by a basal white line, and limited by a white line which runs along inner and costal margins, curves below apex, and is slightly incurved between vein 3 and the submedian; the large space encircled by this line is dull brown, darkest beyond cell and below vein 2; the orbicular is formed by a white ring; the reniform is irregular, defined by a brownish white line; some black spots on costa; two small black spots on inner margin; outer margin darker brown than median space, crossed by white veins on which is a black spot; a terminal black line thickening between the veins; fringe dark grey, with a basal and central buff line. Secondaries light brown; outer margin darker, preceded by an indistinct buff line; a terminal interrupted black line; fringe pale, with a blackish line. Expanse 33 mm.

Habitat.—Guadalajara, Mexico.

Leptina? petrovna.—Head and thorax lilacine, mottled with brown. Abdomen buff, with transverse brown bands. Primaries lilacine, irrorated with dark brown; lines formed by absence of irrorations; a triangular brown space at base below cell; an oblique brown shade from base of vein 4 to middle of inner margin; a triangular brown spot at end of cell, bordered below with white; an outer line not reaching costa, inwardly curved above inner margin; a subterminal white line from costa before apex, strongly toothed at vein 4, and inwardly broadly shaded with dark brown; fringe brown. Secondaries irrorated with brown, especially on outer margin. Expanse 25 mm.

Habitat.—Petropolis, Brazil.

Cyrima muscosa.—Head and thorax pale green; patagiæ with lilacine scales tipped with black. Primaries lilacine, irrorated with darker scales; fine black basal, inner and outer lunular lines; costa pale green beyond inner line, spotted with white towards apex; an apical pale green spot; inner margin, a spot in cell near base, and a space below reniform yellowish green mottled with olivaceous; median black irrorations above and below green space; a terminal darker line; fringe brown, with a pale line at base. Secondaries light greyish brown, darkest on outer margin; fringe light brown. Expanse 26 mm.

Habitat.—Coatepec, Mexico.

Iphimorpha arœnsis.—Head and thorax lilacine buff; a brown spot posteriorly on thorax. Abdomen grey. Primaries lilacine buff; the veins buff, lightly edged with greyish, indistinct traces of basal and inner darker line; a dark streak on inner margin near base; an oblique pale buff spot at end of cell, finely outlined with brown and surmounted by a dark brown streak from middle of costa to origin of veins 3 and 4; a round black spot just beyond upper angle of cell; the outerline buff, partly edged with brown, curved beyond cell; a sub-

terminal row of brown spots; an apical grey space; black spots on costa near apex; outer margin produced at vein 4; terminal brown spots; fringe buff. Secondaries whitish at base, outwardly brown; a thick geminate black discal spot; fringe whitish. Expanse 24 mm.

Habitat.—Aroa, Venezuela.

Iphimorpha chucha.—Head and thorax pale green and grey, irrorated with black. Abdomen dark grey; a subdorsal reddish brown tuft. Primaries lilacine grey, irrorated with dark grey; subcostal median and submedian veins green on basal two-thirds of wing; a green spot at base of cell; orbicular and reniform green; a green spot below orbicular; interrupted fine black angular lines; a black median shade curved at reniform; the outer line dividing a pale grey shade, and followed by black points on veins, outwardly shaded with white; an irregular broad brown subterminal shade; a light grey spot at apex; fringe green, mottled with brown. Secondaries brownish grey; fringe buff. Expanse 27 mm.

Habitat.—Castro, Parana.

Iphimorpha ethela.—Head and thorax lilacine; collar irrorated with black. Primaries dark lilacine; veins on outer margin black; a black streak on submedian from inner to median line; an interrupted black basal and inner line; median line dark, obliquely curved around reniform, and followed by a green spot on inner margin; outer line fine, black, deeply dentate, followed by a paler lilacine shade; some pale spots on costa; a terminal dark line; fringe olivaceous green; secondaries brown; fringe buff. Expanse 28 mm.

Habitat.—Castro, Parana.

Stibadium viridescens.—Head and thorax green, darkest towards abdomen. Primaries pale green, the lines buff; a dark green streak at base of inner margin; inner line straight, slightly angled on submedian, outwardly shaded with olive green; spots large, faintly outlined with buff, separated by a very dark green spot, which is surmounted by olive-green on costa; an olive-green space below cell from inner to outer line, on which is a very dark green line; outer line deeply curved above vein 4, followed by a dark green streak; a subterminal olive green streak from costa; a terminal olive-green line; fringe buff. Secondaries greenish buff; outer margin darker with a subterminal pale line; a minute discal spot. Expanse 35 mm.

Habitat.—Oaxaca, Mexico.

Eustrotia walta.—Head and thorax lilacine brown. Abdomen brown, irrorated with white; a white transverse line posteriorly on each segment. Primaries: base dark velvety brown, followed by a broad grey curved band, divided by a dark line, and outwardly shaded with dark velvety brown, which extends above submedian almost to the outer line; an oblique lilacine band from costa to outer line above submedian, this band enclosing the orbicular, which is whitish with a pale brown spot, and a whitish mark below the orbicular; inner margin broadly lilacine; the outer line, geminate, fine, black, filled in with lilacine; the

space within the outer line light brown, shaded posteriorly with dark velvety brown, and on costa with black and grey; the reniform large, outlined in reddish brown and lilacine; marginal space lilacine and brown; black streaks especially towards costa; an apical black streak; the subterminal irregularly dentate, white; a dark spot on margin and fringe at vein 4. Secondaries brown; the discal spot and outer line of underside faintly visible; a dark terminal line. Expanse 23 mm.

Habitat.—Guadalajara, Mexico.

Eustrotia penthis.—Head, collar and thorax dark grey; patagiæ roseate white. Abdomen greyish. Primaries dark grey; a large roseate spot from base almost to middle of inner margin, on which is a small grey spot at base of inner margin, and it is anteriorly shaded with black; orbicular small, roseate edged with black; reniform very large, white containing some light brown scales; traces of a median and an outer wavy black line; outer margin mottled reddish and olivaceous brown; a subterminal white dentate line, thickest at inner margin, and outwardly edged with black between veins 2 and 5. Secondaries light grey shaded with brown on outer margin. Expanse 20 mm.

Habitat.—Guadalajara, Mexico.

Eustrotia editha.—Head and thorax mottled pale violaceous and brown. Abdomen dull brownish grey, with violaceous subdorsal tufts at base. Primaries: basal half pale ochreous, crossed by black, geminate, basal and inner lines; orbicular small, circled with black; outer half pale olivaceous brown, shaded with white from costa through cell before reniform, which is outlined by small dark points; an outer greyish shade cut by the veins; a subterminal white line, nearly straight; a black spot on margin and fringe between veins 4 and 6; two black terminal points above and two below this spot. Secondaries dull greyish brown; fringe pale, but reddish brown at apex. Expanse 22 mm.

Habitat.—Jalapa, Mexico.

Eustrotia lithodia.—Head and collar pale greyish brown. Thorax lilacine grey, shaded with buff and dark brown. Primaries grey; at base a buff spot between the lines; a brown spot on costa, and one above inner margin; lines fine, geminate, dark brown; a broad dark brown velvety median shade, slightly curved on basal side, outwardly oblique from costa to below reniform, then inwardly oblique to inner margin; reniform large, oblique white, shaded with grey; outer line curved, beyond cell dark, geminate, followed by a black streak between veins 5 and 6, and a brown shade above this streak to costa; a subterminal whitish line; an interrupted terminal dark line; fringe light brown. Secondaries greyish brown, darkest on outer margin. Expanse 21 mm.

Habitat.—Sao Paulo, Brazil.

Eustrotia longena.—Head and thorax buff, mottled with brown. Abdomen dark grey. Primaries buff, mottled with brown; some lilacine at base; basal and inner lines fine, dark, geminate; the inner line deeply curved outwardly; a dark wavy median line; a violaceous space between inner and outer lines, widest on inner margin; reniform large, whitish buff, inwardly bordered

with black; outer line fine, black, dentate, curved beyond cell, incurved below cell; a black dentate subterminal line starting from a small black spot on costa; a terminal dark line; fringe buff, mottled with brown. Secondaries dark greyish brown; a terminal dark line. Expanse 21 mm.

Habitat.—Aroa, Venezuela.

Eustrotia vicina.—Head and thorax lilacine brown. Abdomen dark grey above, reddish below. Primaries: basal half buff, irrorated with lilacine; a small dark grey spot at base of inner margin: a violaceous space on costa at base; inner line geminate, wavy, olivaceous; a black point in cell; an olivaceous transverse shade close to reniform and outer line below it, beyond which the wing is lilacine; the outer line geminate, partly black; the reniform whitish, mottled with olivaceous and partly edged with black; a dark grey subterminal shade; a black apical shade; some marginal dark streaks spotted with white; a little buff on outer margin below apex; a terminal dark line. Secondaries brown, palest at base; a terminal black line. Expanse 16 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Eustrotia marmorata.—Head and thorax cream color, mottled with brown. Abdomen light grey; a subdorsal black spot. Primaries: inner margin to outer line broadly buff, mottled with light reddish brown; basal and inner line fine, black; an olivaceous brown spot on costa near base; some grey and light reddish brown shading below cell; median space from costa to below cell olivaceous brown, mottled with grey; outer line minutely dentate from costa to reniform, around which it forms a broad tooth and is then slightly curved to inner margin; the reniform lilacine grey, followed by a small reddish brown spot; outer space lilacine grey and white; white spots on costa; a white streak at apex; a dark grey subterminal shade; a white and light reddish brown spot at inner angle; a terminal black line interrupted by grey dots; fringe light grey with dark grey spots. Secondaries whitish, irrorated with reddish brown on outer margin; a faint discal spot and median line. Expanse 16 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Eustrotia thionaris.—Head and thorax brown, tinged with lilacine. Abdomen greyish brown. Primaries violaceous brown; the basal and inner lines dark, dull brown, geminate, deeply dentate; orbicular paler, outwardly edged with black and surmounted by a lighter brown spot on costa; a broad dark median shade almost black, slightly curved; the reniform large, indistinct, followed by a black line; the outer line deeply and irregularly curved beyond cell, geminate, partly black, filled in with white near costa; some lilacine scales and four small buff spots on costa towards apex; an irregular black subterminal shade, outwardly bordered with dull brown; terminal black spots between veins, and buff spots on veins; fringe dark, with a basal buff line. Secondaries dark brown. Expanse 29 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Eustrotia hermosilla.—Body buff, irrorated with black; the patagia tipped with black; dark grey subdorsal tufts on abdomen. Primaries: the base

and margins green, irrorated with black; the central space between lines light reddish brown in cell and along outer line; a broad white shade below cell, followed by a blackish line and dark brown shade to submedian; the reniform shaded with green, outlined finely with whitish; inner and outer lines thick, black; outer line followed by a finer black line; some black subterminal shadings, heaviest at costa. Secondaries grey brown; a slightly darker outer line; a dark terminal line. Expanse 20 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes apicata.—Head and collar dark grey. Thorax pale green; patagiæ tipped with grey. Abdomen grey. Primaries pale green; a dark brown spot on costa at base, crossed and edged by a white line; a large brown spot suffused with grey on costa before apex, somewhat triangular and extending to vein 4, inwardly edged with white at costa and spotted with white along costa; a grey spot at base of inner margin; traces of a fine geminate inner and outer black lines, also a median thicker single line; orbicular and reniform very indistinct; the subterminal indistinct; a fine terminal black line interrupted by white points on veins; fringe grey. Secondaries greyish, darkest on outer margin; discal point and outer line of underside visible above; a blackish terminal line. Expanse 19 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes virescens.—Head and thorax pale green. Primaries: basal third pale green, crossed by a black basal line, and limited by the inner line, both being geminate; some buff basally on inner margin; median third of wing buff, irrorated with darker scales; limited by the outer geminate line, which is partly punctiform; the reniform is outlined faintly with brown and has a dark brown spot anteriorly and another posteriorly; a conspicuous dark velvety brown oblique spot from costa to reniform; terminal third of wing pale green, broadly shaded with light brown on middle of outer margin; a white apical shade; an irregular grey subterminal shade; terminal black spots. Secondaries brownish. Expanse 20 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes costipuncta.—Head reddish brown. Collar and patagiæ pale green, the latter tipped with grey. Thorax dark brown. Primaries: costal margin broadly pale green; a broad velvety brown spot at middle of margin extending to orbicular; wing otherwise pale greenish brown; a small grey spot at base of inner margin, surmounted by round buff spot; orbicular and reniform grey, separated by a velvety brown line, diverging a little below the spots and extending on to veins 3 and 4; outer line fine, lunular; pale reddish brown subterminal spots between the veins; an interrupted terminal line. Secondaries brownish; greyish towards base; a brown discal spot. Expanse 23 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes stenelea.—Head and thorax dark steel grey. Abdomen brown basally, dark grey terminally. Primaries dark steel grey; apex very broadly buff, crossed by a reddish brown shade; duller gray basal and inner

interrupted bands; a median buff line, geminate on costal margin; an oblique velvety black spot at end of cell, outwardly shaded with brown; outer line oblique from costa, geminate, buff, incurved below cell and single; a small grey spot on outer margin above vein 4. Secondaries brownish; a dark discal spot. Expanse 15 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes marita.—Head, collar, thorax and anal tuft pale brown. Patagiæ and abdomen grey. Primaries: base and costal margin olivaceous; inner and outer margins whitish; space around reniform grey; a fine geminate black basal line; inner line broadly grey on costa, mottled with white, finer, geminate, on inner margin; a median dark line on costa and inner margins; outer line black, finely dentate from middle of costa, following subcostal and deeply curved beyond cell; outer margin heavily shaded with grey and olivaceous, leaving a whitish apical streak, and a white subterminal line; terminal line black interrupted by veins. Secondaries whitish at base, shaded with brown on outer margin; a discal spot and median dark line. Expanse 19 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes repanda.—Head and collar buff. Thorax reddish brown. Abdomen grey. Primaries dark grey; the inner margin broadly reddish brown to outer line, irrorated with black; minute buff spots on costa towards apex, and along outer margin; an apical white streak; a fine black basal line; orbicular circled with black; reniform with a black line on either side; outer line black, noticeable on inner margin. Secondaries white; apex narrowly shaded with brown. Expanse 17 mm.

Habitat.—Jalapa, Mexico.

Photedes perigeta.—Head and collar light reddish brown. Thorax and primaries dark reddish brown. Abdomen and secondaries dull greyish brown. Primaries: the lines white, irregular; a basal and inner line; the outer line partly punctiform; subterminal most distinct at apex; orbicular small, formed by a white ring edged with black; reniform buff, outlined with white spots; a dark brown terminal line interrupted by white points. Secondaries: fringe roseate at base, outwardly white. Expanse 18 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Photedes? mochensis.—Head and collar grey. Thorax brown, irrorated with grey. Abdomen reddish brown, with narrow transverse grey lines. Primaries dark brown, shaded with violaceous; a basal and inner line, straight, buff, edged with black; a fine black median shade; outer line curved, black, outwardly shaded with buff; orbicular a black point; reniform slightly larger, black; buff points on costa towards apex; a fine lunular terminal dark line; a pale line on base of fringe. Secondaries dark greyish brown; a discal spot; median and outer darker lines; fringe reddish, a pale line at base. Expanse 18 mm.

Habitat.—Jalapa, Mexico.

Tarache angularis.—Head and abdomen buff, irrorated with dark grey scales. Thorax mottled buff and violaceous brown. Primaries brown, tinged with violaceous; costa margin light brown; inner line buff, outwardly edged with dark brown; angled on median vein; orbicular round, circled with black; reniform long, narrow, upright, buff, outlined with black; outer line buff, angled beyond cell, enclosing a triangular brown spot, straight from below reniform to inner margin, followed by a broad buff space, crossed by a fine dark subterminal line extending to apex, leaving a brown space on costal margin before the apex; outer margin greyish brown, with a dark brown shade above inner margin next to the buff space; an interrupted terminal line. Secondaries greyish brown; an interrupted dark terminal line; a small discal spot, fringe buff. Expanse 30 mm.

Habitat.—Castro, Parana.

Tarache triangularis.—Body lilacine buff, the segments of abdomen anteriorly darker. Primaries: anterior portion of wing from inner margin near base to just below apex buff; reniform and outer line buff, leaving a large, triangular space above inner margin, and the outer margin dark brown; the triangular dark space edged by a still darker line; outer line fine, wavy, oblique from costa to vein 10, then fine brown, geminate, filled in with buff to below reniform, then straight, and filled in with white to inner margin; reniform outwardly edged with dark brown; below reniform the outer line is outwardly shaded with buff and followed by a curved dark shade; a dark brown point before apex. Secondaries greyish brown, becoming darker on outer margin; an interrupted dark terminal line; a discal point; fringe buff and light brown. Expanse 28 mm.

Habitat.—Petropolis, Brazil.

Tarache mediana.—Body buff, with darker irrorations. Primaries lilacine buff, with darker irrorations; space from inner to outer line dark brown; lines fine, brown, geminate, filled in with buff; inner line inwardly oblique from costa; the outer line curved around cell, slightly incurved below reniform; the reniform buff, outlined laterally with white and dark brown; the small space between reniform and outer line is also buff; a large brown spot on costa near apex; some small white spots on costa towards apex; outer margin shaded with darker lilacine buff; an interrupted dark terminal line on both wings. Secondaries greyish brown, thinly scaled. Expanse 26 mm.

Habitat.—Castro, Parana.

Tarache puella.—Head and thorax dark brown, irrorated with roseate. Abdomen dark greyish brown. Primaries: base roseate, irrorated with black; basal and inner lines black, fine, geminate; the inner line angled on submedian, the angle filled with black; a clear roseate streak below cell; a median steel grey space from costa, where it is narrow, to submedian, below which the inner margin is roseate, with gray irrorations; orbicular oblique, greyish roseate, circled with black, beyond which is a dark shade to inner margin near the outer line; reniform large, oblique, roseate outlined with white and then black; around the reniform the wing is browner, with black shades; outer line olivaceous, inwardly edged with black, outwardly with darker olivaceous and followed by a whitish streak from inner margin to apex; outer margin brown; a subterminal white

line; a terminal black line interrupted by buff points on veins. Secondaries dull greyish brown. Expanse 24 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Tarache praxina.—Head and collar white. Thorax pale olivaceous. Abdomen buff. Primaries white, mottled with light olivaceous green, leaving basal, inner, median, outer and subterminal white lines; spots white, with a few olivaceous scales; the subterminal forming a streak from apex to outer line then curving and nearly straight to inner margin; fringe pale, spotted with olivaceous. Secondaries whitish; a small discal point; faint outer, subterminal and terminal olivaceous shade. Expanse 23 mm.

Habitat.—Castro, Parana.

Tarache caterva.—Body grey; black irrorations on abdomen. Primaries grey, thinly irrorated with black and brown; inner line geminate, dark, filled in with buff, angled on subcostal; a fine median line, followed by a brown shade to reniform and outer line below it; orbicular and reniform outlined with black; outer line geminate, filled in with buff; a brown space on costa before apex; subterminal small dark spots; terminal black spots; fringe grey, with a buff line at base. Secondaries dark grey; a subterminal interrupted black line. Expanse 19 mm.

Habitat.—Castro, Parana.

Tarache villica.—Head and thorax dark brown. Abdomen and secondaries dark brown, almost black. Primaries blackish grey; the outer margin and a median space below cell and above submedian golden brown; basal and inner lines fine, black, geminate; orbicular small, golden brown; reniform inwardly edged with a golden brown lunule; outer line fine, black, partly shaded with grey; a lunular dark subterminal line. Expanse 22 mm.

Habitat.—Sao Paulo, Brazil.

Tarache? pyralina.—Head and thorax mottled grey and brown. Abdomen greyish brown. Primaries silvery white; the lines thick, heavily irrorated with green, also the cell; basal and inner lines dentate; median line angled before reniform; outer line dentate curving beyond cell, then inwardly oblique; subterminal suffusing with marginal spots at apex and on middle of outer margin; orbicular small, white; reniform narrow, upright, divided by a black line; a terminal black line; fringe white, spotted with grey. Secondaries whitish yellow, irrorated with grey on basal half; outer margin and subterminally the veins dark also; fringe yellow, spotted with grey. Underneath the primaries are black, with marginal yellow spots; the secondaries yellowish, with median and subterminal dark shades; a terminal dark line; veins terminally dark. Expansa 30 mm.

Habitat.—Guadalajara, Mexico.

Tarache violetta.—Palpi ochreous brown. Head and thorax dark brown. Abdomen and secondaries dull greyish brown. Primaries dark brown; an interrupted lilacine white line from costa at one-third from base, abruptly

curved to base of median vein; orbicular small, dark grey, circled with lilacine; reniform very large, irregular, dark grey, outlined with lilacine white; outer line lilacine white, followed by a broad dark gray shade; a marginal, deeply dentate lilacine white line. Expanse 21 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Tarache viridans.—Head and thorax white. Abdomen buff. Primaries yellowish white; a slight basal, and a thick inner curved green line; a very faint greyish median shade; the orbicular as a grey point; the reniform larger, grey; the outer line olive-green, oblique from costa to a dark green space beyond reniform, then black, incurved below it; the portion of line below reniform is inwardly shaded with white, outwardly broadly with dark green; outer margin lighter green, mottled with buff at inner margin; some reddish brown spots on costa near and at apex. Secondaries whitish, the outer margin narrowly greyish brown. Expanse 16 mm.

Habitat.—Rio Janeiro.

Tarache? benita.—Body dark brown; collar and segment of abdomen posteriorly edged with greyish; thorax mottled with reddish brown. Primaries: base brown; a basal grey line to median vein, then reddish brown, limited by a wavy grey inner line outwardly edged with black; median space dark brown; a dark grey patch below cell; orbicular small, light brown, circled with black; a median dentate black line; reniform large, white, partly edged with black, followed by a grey spot; outer line white, inwardly broadly shaded with black beyond cell, and below vein 3, outwardly finely edged with grey-brown, which is followed by a broad white shade; costal margin white above reniform; outer margin broadly dark grey, cut by a fine subterminal white line; the apex reddish brown; a similar shade on outer margin from vein 4 to inner angle; a terminal black thickening between the veins. Secondaries brown; the fringe tipped with white. Expanse 19 mm.

Habitat.—Castro, Parana.

Toxophleps? bilinia.—Body brownish grey. Primaries grey, irrorated with brown; an inner dentate and an outer slightly wavy dark brown line; a black point in place of reniform; a subterminal faint brown shade; an interrupted terminal black line. Secondaries light brown; a faint dark median line; a dark terminal line. Expanse 18 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Toxophleps pallida.—Head and thorax white. Abdomen grey. Primaries whitish at base, otherwise grey; and indistinct curved white inner line; a broad, brown, median shade; a curved, white outer line; two black points on orbicular and reniform; a subterminal black spot above submedian and one at apex; fringe white. Secondaries white, clouded with brown on outer margin; fringe white. Expanse 15 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Erastria cogela.—Head and thorax reddish brown, irrorated with lilacine scales. Abdomen buff, irrorated with brown. Primaries reddish brown, mottled with buff; the veins and costal margin irrorated with lilacine and dark grey; spots indistinct, faintly outlined in buff; a greyish shade between the spots; a fine buff line from costa near apex to middle of inner margin, shaded inwardly with darker brown, outwardly with buff; the apex shaded with buff. Secondaries buff, thinly irrorated with brown; a dark outer line. Expanse 21 mm.

Habitat.—Castro, Parana.

Erastria mirabilis.—Head and thorax dark grey. Primaries: base dark grey, extending along inner margin, and followed by a buff shade; costal margin to outer line olivaceous brown, and a similar shade beyond reniform, which is large, olivaceous brown, outlined with darker brown; fine, inner, median and outer brown lines; a curved roseate white subterminal line, outwardly shaded with dark brown, broadly so on costal margin; apex dark grey, irrorated with white; a terminal dark line; fringe dark grey, divided by a black line. Secondaries light brown; veins and terminal line darker; fringe pale, divided by a dark line. Expanse 19 mm.

Habitat.—Sao Paulo, Brazil.

Erastria oletta.—Head and thorax light brown. Abdomen and secondaries grey brown. Primaries: basal half reddish brown, crossed by a white inner line, curved in cell, and there preceded by a small grey spot; darker brown streaks in and below cell; reniform marked with white and grey; outer line deeply curved beyond cell, dark grey, inwardly shaded with white and preceded by a white line; outer margin light brown; a subterminal darker shade. Secondaries greyish brown. Expanse 17 mm.

Habitat.—Castro, Parana.

Lithacodia castrensis.—Head and collar brown. Abdomen grey. Primaries: base to outer line brown; traces of a black basal and inner line outwardly shaded with lighter brown; a blackish median shade; orbicular as a white point circled with black; reniform steel grey, edged laterally with light grey; outer line light grey; outer margin lighter brown; a broad black subterminal shade from costa to vein 2; fringe brown, with a pale line at base. Secondaries greyish brown, darkest on outer margin; a dark discal spot; fringe grey, divided by a black line. Expanse 19 mm.

Habitat.—Castro, Parana.

Thalpochares costagna.—Head, collar and thorax violaceous brown; patagiæ cream color. Abdomen light brown above, darker brown below. Primaries: anterior portion of wing, from inner margin near base to costal margin near apex, creamy buff, shaded with light brown on middle of costal margin, where there is also a fine black oblique line; base of costa finely black; posterior portion of wing lilacine brown within inner line and on outer margin; reddish brown between the inner and outer lines; a small white spot below vein 2; the lines only visible on dark portion, finely black, partly shaded with white; a blackish subterminal shade; an interrupted black terminal line; a pale line at

base of fringe. Secondaries whitish, faintly clouded with brown at apex; a dark line on fringe. Expanse 17 mm.

Habitat.—Sao Paulo.

Thalpochares? mirella.—Body dark brown above, whitish underneath; wings dark brown. Primaries: fine inner and outer lines, whitish, edged with blackish brown; the inner line slightly oblique; the outer line curved around cell; some greyish scales on reniform; a buff spot on fringe above inner angle, and another before apex; three minute buff spots and a fine whitish streak on costa near apex. Secondaries with the fringe terminally white. Expanse 19 mm.

Habitat.—Orizaba, Mexico.

Thalpochares guarama.—Head and thorax buff, irrorated with black; abdomen greyish. Primaries buff, irrorated with grey; a broad paler space below subcostal to apex, irrorated in cell with light brown; inner line fine, black, inwardly shaded with white; outer line from middle of costa deeply curved beyond cell, fine, black, outwardly shaded with white; a black streak below cell from inner to outer line; a black subterminal spot between veins 2 and 4; an interrupted black terminal line. Secondaries whitish, irrorated with grey on outer margin; a grey discal spot. Expanse 21 mm.

Habitat.—Sao Paulo.

Thalpochares? nigripalpi.—Palpi and frons black. Vertex and collar buff. Thorax lilacine brown; patagiæ tipped with black. Abdomen buff at base, otherwise brown above; black underneath. Primaries: base black, outwardly shaded with brown, and with a buff spot at base of inner margin; median space buff, irrorated with black; reniform as a black point; an indistinct irregular dark grey, interrupted, outer line followed by brown, and then by a broad black shade; outer margin brown, separated from the black space by a subterminal buff line above inner margin; pale spots on costa near apex; black terminal spots; fringe mottled black and brown. Secondaries whitish; a black discal spot; brown shadings on outer margin; a black terminal line; fringe grey and brown. Expanse 20 mm.

Habitat.—Castro, Parana.

Thalpochares? lorna.—Head, collar and thorax green. Abdomen dark grey. Primaries green; a fine indistinct inner darker green line; a black point as orbicular and reniform; below the spots an oblique median grey shade to inner margin; some pale longitudinal streaks above reniform; outer line fine, black, inwardly broadly shaded with dark green, outwardly followed by a white line, which is broadly white from vein 6 to apex; a subterminal white shade from inner margin to vein 5; terminal black spots; fringe whitish, spotted with green. Secondaries dark grey, paler at base; a dark discal point. Expanse 16 mm.

Habitat.—Castro, Parana.

Thalpochares gisella.—Head and thorax grey, with brown irrorations. Abdomen and secondaries greyish brown. Primaries white, shaded with pale

brown, the costa irrorated with grey; a lunular blackish line from near base of costa to middle of inner margin; a black median line on costa; a black discal point; a black outer line, broad at inner margin, and cut by veins; a subterminal brownish line; black terminal streaks between the veins. Expanse 18 mm.

Habitat.—Aroa, Venezuela.

Pseudina janeira.—Head and thorax buff. Abdomen greyish brown. Primaries buff; basal half of costa finely black, shaded below with dark brown; an olive-brown streak in cell before middle; spots consisting of a few greenish lines; a green patch between the spots; the reniform followed by a green shade to outer line; a greenish median space below cell, crossed by a geminate dark green line; some roseate on inner margin; outer line fine, dentate, green, curved beyond cell, crossing a greenish patch from veins 4 to 7; a subterminal broad dark velvety brown line, evenly curved, outwardly shaded with roseate and followed by a fine, light brown shade; outer margin and fringe light grey, separated by a wavy black terminal line. Secondaries greyish brown; fringe greyish. Expanse 29 mm.

Habitat.—Rio Janeiro.

Aeontia? harmina.—Head and thorax olivaceous brown. Abdomen and secondaries brown. Primaries pale olivaceous, tinged with buff along subcostal, and with reddish on inner margin; a pale line from costa near apex, parallel with outer margin to vein 4, then incurved to inner margin, beyond which the wing is reddish brown; the fringe olivaceous. Fringe on secondaries light grey. Expanse 20 mm.

Habitat.—Castro, Parana.

Aeontia? medalba.—Palpi dark grey. Vertex light brown. Thorax grey-brown. Abdomen light brown. Primaries silky; some white at base, followed by olivaceous brown, limited by a white inner shade angled at cell; an oblique median whitish shade, widest on costa; outer space and margin olivaceous brown; a subterminal white line, oblique from costa, angled below apex, and irregularly dentate to inner margin; a terminal white line, on which is an interrupted black line. Secondaries whitish; a subterminal grey brown shade. Expanse 22 mm.

Habitat.—Castro, Parana.

Spragueia inversa.—Head and thorax light brown. Abdomen dull brown. Primaries light brown; two oblique white spots on costa, one near base, the other at middle; a blackish shade between these spots, bifurcating on inner margin, and irrorated with pale olivaceous scales; apex white, shaded with buff, and preceded on costa by an olivaceous brown space, which extends obliquely to middle of outer margin; fringe buff, mottled with brown and black below vein 4. Secondaries dull brown. Expanse 17 mm.

Habitat.—Aroa, Venezuela.

Spragueia margarita.—Head white, collar and thorax greenish grey; a yellow green tuft posteriorly. Abdomen and secondaries dull brown grey.

Primaries olive-green, darkest on median space; a large yellow space at base; a median dark grey shade; reniform similar; outer line blackish, broken into spots on inner margin; a triangular pure white spot on costa above reniform; some dark grey marginal spots, partly shaded with creamy white; a terminal white line outwardly edged with black at apex and a little above inner angle; fringe white, except at apex, where it is dark green. Expanse 16 mm.

Habitat.—Aroa, Venezuela.

Spragueia taragma.—Head, collar, abdomen and secondaries light greyish brown; thorax darker. Primaries light olivaceous brown; a dark reddish brown oblique line from base of costa to inner margin; a buff elongated median spot on costal margin; a black spot on fringe at vein 4; above this, fringe yellowish, below it, brown. Secondaries greyish brown, darkest on outer margin. Expanse 17 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Spragueia tarasca.—Head and thorax grey. Abdomen light brown. Primaries olivaceous brown, irrorated with white scales; three white spots on costa, near base, one median space, and before apex; an inner and a median black line; the outer black line deeply incurved below end of cell; an interrupted white terminal line; fringe mottled olivaceous brown, buff and black. Secondaries greyish brown, pale in the disc. Expanse 16 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Thyria crœsita.—Head and thorax brown. Abdomen yellow; a black subdorsal line; anal tuft black. Primaries reddish brown; the lines violaceous edged with dark brown; the basal line silver, followed by a silver spot in cell; the inner line interrupted by a silver spot in cell, outwardly curved on submedian and followed in cell by four silver spots radiating from a central point; discocellular silvery, followed by a silver lunule; a large silver spot between veins 2 and 5; outer line deeply outcurved, inwardly shaded with dark brown, outwardly followed by dark brown intervenal spots; marginal silver spots above veins 2 increasing in size to apex; the spot between veins 5 and 6 cut by an oblique brown line; fringe white at base, then dark brown, terminally mottled brown and white. Secondaries yellow; the outer margin broadly dark brown. Expanse 27 mm.

Habitat.—Castro, Parana.

Thyria satana.—Head and thorax mottled lilacine and dark brown. Abdomen yellow; a dark subdorsal line and lilacine brown tufts. Primaries brown, irrorated with lilacine; the lines dark velvety brown, edged with lilacine; basal line interrupted in cell; inner line wavy, interrupted by veins; the outer line lunular, interrupted by veins; subterminal brown spots, and darker terminal lunular spots; in cell a fine silvery mark; discocellular dark, shaded with lilacine white. Secondaries yellow; the outer margin broadly dark brown; fringe white, spotted with brown. Expanse 33 mm.

Habitat.—Castro, Parana.

Nænia marama.—Head and thorax grey; abdomen brownish grey. Primaries grey, shaded with light brown; veins on outer margin black; lines black; a basal curved geminate line; inner line geminate, evenly curved to submedian, then outwardly toothed; orbicular circled with black; reniform outlined with black, cut by the black median shade, which is most marked on costa; outer line deeply dentate; some black streaks below costa before apex; terminal black points between the veins. Secondaries whitish on basal half, outwardly dark brown-grey; fringe whitish; tips of veins blackish. Expanse 33 mm.

Habitat.—Aroa, Venezuela.

Angitia pulchra.—Head and thorax dark grey, mottled with brown. Abdomen grey-brown. Primaries: base brown, crossed by a black line, and with a buff streak below submedian; median space steel-grey, this color extending along inner margin to angle, and it is irrorated with black on costal margin; spots light brown, shaded with dark brown, the orbicular minute; the outer line geminate, black, suffusing and heavily marked above reniform, followed above vein 5 by some olivaceous brown, and between veins 3 and 5 by a blackish shade extending on to fringe; apex greyish buff, with darker lines, and a brown spot on fringe below apex, a blackish spot above inner angle; two white spaces on fringe. Secondaries dark brown; fringe outwardly white. Expanse 28 mm.

Habitat.—Aroa, Venezuela.

Angitia perplexa.—Head and thorax buff. Abdomen with black subdorsal tufts and lateral grey scales. Primaries brown, with darker irrorations; basal half of costa and a basal space above submedian buff, crossed by a fine dark basal line, and limited by a thick black inner line; reniform buff, surrounded by a dark greyish shade; the outer line hardly visible, except on costa, where it forms a blackish oblique streak and is followed by a buff shade; a fine buff, subterminal line; an interrupted black terminal line; fringe brown, streaked with buff at ends of veins. Secondaries dark brown; fringe buff, spotted with brown. Expanse 24 mm.

Habitat.—Aroa, Venezuela.

Angitia? viridans.—Head and thorax light reddish brown. Abdomen greyish brown; subdorsally reddish brown. Primaries olive-green, crossed by geminate black lines and irrorated with black; orbicular circled with black; a black circle below orbicular; reniform finely outlined with black; fringe brown, tipped with white, interrupted by a dark brown spot between veins 3 and 4, and by a reddish brown spot at inner angle. Secondaries greyish brown, dark on outer margin; fringe white, shaded with reddish brown at apex. Expanse 21 mm.

Habitat.—Castro, Parana.

Eupalindia magnifica.—Head and thorax reddish brown, irrorated with lilacine. Abdomen dark brown. Primaries: base reddish brown, irrorated with golden brown, this space wide on costa, narrow on inner margin, limited by a lilacine shade; outer shade broad, lilacine, curved beyond cell; the median space lilacine grey; the orbicular brown, broadly circled with lilacine; the reniform linear, inwardly curved, edged with lilacine, except outwardly; a brown

shade from reniform to inner margin; outer shade limited by a greyish line, geminate on costa and followed by a reddish brown shade mottled with lilacine grey; outer margin golden brown, the veins lilacine grey. Secondaries brown; a reddish brown spot at anal angle; fringe mottled with grey. Expanse 27 mm.

Habitat.—Sao Paulo, S. E. Brazil.

rubrescens.—Body and wings glossy lilacine brown. Primaries: a fine reddish brown line from costa to middle of inner margin, where it curves and extends to costal margin at three-fourths from base; orbicular as a grey point; reniform thick, linear, greyish; a fine reddish brown shade from reniform to inner margin; subterminal minute reddish brown and grey points on veins; fringe tipped with white. Expanse 28 mm.

Habitat.—Castro, Parana.

Makapta argentescens.—Head and collar reddish buff. Thorax grey. Abdomen olivaceous brown. Primaries silvery grey, slightly olivaceous; lines yellowish buff; inner line very slightly curved; an oblique line angled at apex to middle of inner margin; an outwardly oblique line from costa at two-thirds from base to this line; a subterminal line parallel with outer margin; a white point in cell, finely circled with dark grey; an outwardly curved discocellular line. Secondaries greyish buff. Expanse 32 mm.

Habitat.—Castro, Parana.

Stellidia funerea.—Violaceous black, irrorated thinly with greyish brown scales. Primaries: inner and outer black lines partly finely shaded with greyish brown; reniform greyish brown, divided by a black line; some buff spots on costa before apex and on outer margin. Secondaries with an outer line, and a large discal spot divided by a black line. Expanse 25 mm.

Habitat.—Castro, Parana.

Stellidia nivosita.—Body dark brown; abdomen mottled with grey. Primaries dark brown; outer half of costal margin spotted with white; terminal white spots at end of veins; inner and outer punctiform white lines; orbicular and reniform round, white, the reniform surrounded by four smaller white spots; a white spot above vein 2 close to cell; a subterminal row of white spots. Secondaries white, irrorated with dark brown, very thinly on basal half, and forming an outer and subterminal shade; terminal white points; fringe brown. Expanse 22 mm.

Habitat.—Castro, Parana.

Stellidia diana.—Head and thorax light. Abdomen buff. Primaries greyish buff, irrorated with brown; blackish spots on costa at origin of veins; a fine brown basal line; inner line wavy; outer line dentate, and wing heavily shaded with dark brown on inner margin; a black point in cell near inner line; reniform small, black, shaded with brown; subterminal faint, brown, preceded by a black spot on costa; triangular brown terminal spots; fringe buff, spotted with grey. Secondaries white, with some brownish terminal spots; fringe white, spotted with grey. Expanse 39 mm.

Habitat.—Castro, Parana.

Herminodes lignea.—♀. Palpi dark brown underneath, buff above. Head, collar and thorax black; the patagiæ with a few black irrorations. Abdomen grey-buff. Primaries buff, the veins edged with grey, thinly irrorated with black; a black point at base of subcostal; black points in place of orbicular and reniform; outer margin and fringe shaded with dark reddish brown. Secondaries grey-brown, the veins buff. Expanse 32 mm.

Habitat.—Castro, Parana.

Herminodes? taltula.—Body buff, irrorated with black. Primaries buff, irrorated with black, the veins finely edged with grey; a brownish shade along median vein from base to outer line; basal third of costa finely dark grey; a black point at base of subcostal; orbicular and reniform as black points; a black point below middle of cell; an outer row of black points; a few black subterminal streaks; terminal points between the veins. Secondaries light greyish brown; terminal dark points. Expanse 29 mm.

Habitat.—Castro, Parana.

Strabea punctilinea.—Palpi dark brown. Head, thorax and primaries light brown. Abdomen buff. Primaries thinly irrorated with black; a slightly curved black outer line, orbicular and reniform as black points; fringe tipped with white. Secondaries buff at base and inner margin, otherwise light brown. Expanse 40 mm.

Habitat.—Castro, Parana.

Lepidodes pectinata.—Body brown, the thorax irrorated with grey spatulate scales. Primaries: below cell and vein 2 to outer line violaceous brown, with dark velvety lines and shades above the submedian; cell and between veins 2 and 4 lilacine brown; the costa greyish, with olivaceous brown inner and median shades; orbicular and reniform slightly darker, partly outlined with dark brown; a paler brown space between reniform and outer line, with a dark point between 4 and 5; outer line oblique from costa, then dentate, the inner portion dark at margins; an oblique dark brown shade from costa, beyond the outer line; outer margin grey, crossed by a black lunular line. Secondaries brown, darkest along the inner margin; darker brown and whitish mottlings at anal angle; a terminal dark line preceded by a whitish shade. Antennæ pectinated to tips. Expanse 45 mm.

Habitat.—Rio Janeiro.

Massala marmona.—Head and thorax light reddish brown; a dark line posteriorly on collar and on thorax. Primaries brown; costal vein at base and subcostal for two thirds shaded with lilacine, and irrorated with black; a black line from costa at one-fourth from base to inner margin near base, outwardly shaded with buff from submedian to median vein on which it continues to outer line; a geminate black inner line near base on inner margin; a median black shade from cell to inner margin; orbicular small, black, preceded by a light reddish brown shade; reniform oblique, grey, shaded with white, preceded and followed by a black line edged with light brown; outer line oblique, angled between veins 6 and 7 well beyond cell, then incurved to below reniform, where it is then

preceded by another black line to inner margin; from vein 4 to angle the outer line is very fine; from costa near apex a white shade extends obliquely to vein 4, and then curves inwardly, parallel to outer line; beyond this white shade the veins are light brown; a subterminal white line inwardly shaded with black from vein 7 to inner angle; an interrupted black terminal line thickening between the veins. Secondaries duller brown; a median dark line with white points on veins; a subterminal pale line; surmounted by a black spot on inner margin; terminal line as in primaries. Expanse 40 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Massala carilia.—Light brown. Primaries: a darker inner line from cell to inner margin near base; a darker median shade from subcostal to inner margin, where it is wider; a black point as orbicular; reniform pale, defined by a horseshoe-shaped line, open posteriorly; from reniform to near apex a large brown space on costal margin, posteriorly rounded; subterminal black spots; terminal black points. Secondaries: subterminal and terminal black points. Expanse 35 mm.

Habitat.—S. E. Brazil.

Gustiana guarda.—Head, collar and abdomen light grey-brown. Thorax grey. Primaries grey, with darker irrorations; lines dark brown-grey, slightly curved, parallel; a fine darker subterminal shade; a terminal black line. Secondaries light gray brown; a dark terminal line. Expanse 20 mm.

Habitat.—Guadalajara, Mexico.

Boana broda.—Palpi greyish brown, third segment tipped with buff. Body and wings dark grey brown. Primaries: lines darker, inner line oblique on costa, indentate in cell, curved below cell, inwardly shaded with pale grey; outer line outwardly shaded with pale grey below subcostal, nearly straight, the portion at end of cell being more removed from base; small subterminal spots outwardly shaded with white, a terminal black line preceded by white spots; underneath the inner margin broadly white. Secondaries: costal margin broadly white; a terminal black line partly shaded inwardly with grey. Expanse 28 mm.

Habitat.—Trinidad.

Boana aroalis.—Palpi: second joint ochreous buff; third joint buff, with a black circle. Body and secondaries grey-brown. Primaries grey-brown, tinged with lilacine; lines darker; inner line inwardly edged with lilacine, slightly curved; outer line outwardly edged with lilacine, very slightly curved at end of cell; a very indistinct subterminal dark shade; some white spots on costa towards apex; a dark terminal line, inwardly shaded with lilacine; a similar terminal line on secondaries. Costal margin of secondaries broadly pale lilacine grey. Underneath the inner margin of primaries is broadly lilacine grey. Expanse 25 mm.

Habitat.—Aroa, Venezuela.

Hypena zarabena.—♂. Dark brown. Primaries: a straight yellow band from costa at two-thirds from base to inner margin near angle, crossed by a

fine brown line; a white point in cell circled with black; an apical black spot inwardly shaded with white; an irregular subterminal row of small white spots, the one nearest costa inwardly shading a black spot. Underneath dull brown; a terminal and a subterminal dark spot above vein 7 on primaries. Expanse 32 mm.

Habitat.—Orizaba, Mexico.

Hypena drucealis.—Light grey-brown. Primaries: a large blackish brown space resting on costal margin, inwardly edged by a buff line, which is outwardly oblique from costa at one-fourth from base to middle of submedian vein, and is outwardly edged by the pale outer line, which is oblique from costa at its middle, incurved between veins 5 and 2, then inwardly oblique to inner margin; a dark grey costal shade towards apex; outer margin darker above vein 3; a broad subterminal greyish shade. Expanse 30 mm.

Habitat.—Orizaba, Mexico.

This is the *Hypena manalis* of the Biologia, but it is not Walker's species.

Hypena castricalis.—Body and secondaries dark brown. Primaries violaceous brown; lines dark olivaceous brown; inner line wavy to median, then once curved outwardly to inner margin; outer line outcurved at end of cell, and less so above submedian, outwardly shaded with some white scales; a subterminal shade interrupted by the lines and outwardly shaded with white; a dark terminal line preceded by small white spots between the veins; some lilacine irroration on costa and apex; a white point in cell inwardly edged with black. Underneath dull brown. Primaries: the costa irrorated with white; a small white subterminal spot above 7. Secondaries: a black discal point; a dark median line, and a dark subterminal line. Expanse 34 mm.

Habitat.—Castro, Parana.

Hypena tepecalis.—Head, thorax and primaries light brown, slightly olivaceous. Abdomen and secondaries duller brown. Primaries: lines as in *H. castricalis*, darker brown, but with fewer white irrorations; the subterminal with a few greyish irrorations outwardly; terminal dark line preceded by lighter brown spots. Underneath a black subterminal spot above and below vein 7. Expanse 34 mm.

Habitat.—Coatepec, Mexico.

Hypena calistalis.—Head, thorax and primaries light brown, with darker irrorations. Abdomen and secondaries greyer brown. Primaries: lines darker brown; inner line fine, once curved below cell; outer line curved around end of cell, then faintly wavy to inner margin, outwardly shaded with lighter brown; a black point in cell; a minute dark crescent at end of cell around a grey point; small subterminal dark spots partly shaded with grey; a thick terminal black line. Secondaries: a dark terminal line; fringe paler, divided by a dark line. Underneath no apical nor subterminal spots on primaries. Expanse 26 mm.

Habitat.—Trinidad.

Hypena purpuralis.—Palpi and head dark grey, thorax and primaries dark violaceous brown. Abdomen and secondaries dull dark brown. Primaries: the lines dark olivaceous brown; the inner line oblique from costa, incurved on submedian; outer line incurved below vein 3 and below submedian, outwardly shaded with grey between veins 2 and 3; orbicular and reniform black, minutely shaded with grey outwardly; subterminal black spots faintly shaded with grey outwardly; a terminal dark line, punctiform between veins and preceded by a pale spot. Underneath with a small white subterminal spot above vein 7. Expanse 32 mm.

Habitat.—Aroa, Venezuela.

Allied to *H. exceptalis* Walk.

Hypena bergealis.—Body brown. Primaries brown, shaded with lilacine beyond outer line; inner line dark brown, inwardly shaded with light brown, slightly oblique, incurved between subcostal and submedian; outer line dark brown, outwardly shaded with light brown, straight on costa and below vein 2, very slightly curved around cell; orbicular small, black and white; reniform vague, dark, followed by a light brown shade; outer line followed by a dark curved shade, and subterminal irregular dark spots; a blackish shade at apex; some lilacine scales on outer margin between veins 4 and 7. Secondaries dark greyish brown; a dark terminal line. Underneath: primaries dark lilacine grey; the inner margin whitish. Secondaries whitish, thinly irrorated with dark brown scales; a black discal spot, and a dark median line. Expanse 29 mm.

Habitat.—Jamaica, B. W. I.

Hypena rosealis.—Head and collar roseate. Thorax greenish yellow. Abdomen buff, irrorated with reddish brown. Primaries: basal half greenish yellow; outer half and costa also basally roseate; a fine red median line from end of cell at vein 4 to middle of inner margin; a fine red line from subcostal at four-fifths from base to inner margin, outwardly shaded with yellow; the veins terminally streaked with greenish yellow. Secondaries grey, shaded with roseate on outer margin; fringe roseate. Expanse 23 mm.

Habitat.—Jalapa, Mexico.

Hypena freija.—Head and thorax brown. Abdomen and secondaries light brownish grey. Primaries: brown to outer line on outer margin; a darker brown wavy inner line; a black point in orbicular; a dark oblique streak on reniform; outer line dark brown, inwardly oblique from costa, wavy below reniform, followed by a broad lilacine space extending to apex, and crossed by a broad greyish shade; some dark brown subterminal spots; fringe dark grey. Underneath: primaries dark grey, the costa and apex irrorated with buff. Secondaries whitish, irrorated with grey; a black discal point; a median and a subterminal brown shade. Expanse 35 mm.

Habitat.—Rio Janeiro.

Hypena syllificalis.—Head and thorax lilacine brown, the scales with paler tips. Abdomen dark grey. Primaries lilacine brown, thinly irrorated with

black; a fine inner and median dark wavy line; orbicular black, outwardly scaled with white; reniform as a slightly dark line; no outer line; subterminal black spots, outwardly shaded with white; two darker brown subapical streaks from costa to outer margin. Secondaries dark grey; the costal margin whitish. Expanse 35 mm.

Habitat.—Aroa, Venezuela.

Hypena dasialis.—Head and thorax dark buff. Abdomen and secondaries grey brown. Primaries: the inner margin to well above submedian, the outer margin to just above vein 4, and the costal margin from outer line to apex dark buff; otherwise very dark brown; the basal half of costal and inner margin below submedian tinged with lilacine; some lilacine in cell interrupted by a brown shade between orbicular and reniform, which are dark brown; the inner line still darker, inwardly shaded with lilacine, not extending below dark portion; outer line broadly geminate, filled in with lilacine grey, curved and reaching inner margin; a curved row of black subterminal points visible only on buff portion of costa and outer margin; an interrupted dark terminal line preceded by whitish crescents. Underneath dark grey; a subterminal black spot followed by a buff streak above vein 7. Expanse 30 mm.

Habitat.—Rio Janeiro.

Hypena rivalis.—Body buff, the abdomen irrorated with grey. Primaries buff, irrorated thinly with light brown; orbicular and reniform minute, dark brown; an outer row of black spots on veins; a terminal row of black spots between veins; an oblique dark shade from vein 3 to apex. Secondaries buff, irrorated with dark grey. Expanse 24 mm.

Habitat.—Rio Janeiro.

Hypena jonesalis.—Palpi light brown. Thorax dark brown. Abdomen and secondaries blackish brown; the anal tuft white. Primaries dark brown, slightly tinged with lilacine; the inner margin paler; a pale space from middle of costa to apex, posteriorly curved and edged with darker brown; orbicular and reniform as black points; the reniform geminate; subterminal black spots, one of which is on pale costal space. Underneath dull greyish brown. Expanse 30 mm.

Habitat.—Castro, Parana.

Hypena perialis.—Palpi blackish brown. Thorax dark violaceous brown. Abdomen and secondaries dull dark brown. Primaries rich brown; the inner margin paler, tinged with lilacine; a still paler space on costa from one-third from base to apex, slightly curved posteriorly; orbicular as a black point; reniform as two superposed black points; lines fine, indistinct, reddish brown; the inner line oblique from costa to above submedian, then nearly straight; the outer line wavy from pale costal space to inner margin; black subterminal spots, the one on pale costal space, and at inner margin heavily shaded with white. Expanse 43 mm.

Habitat.—Peru.

Hypena glumalis.—Palpi and head light reddish brown. Thorax slightly darker. Abdomen and secondaries dark greyish brown Primaries: inner margin and outer margin to vein 4 buff, shaded with reddish brown, otherwise dark grey; some dark grey at base of inner margin, and then some lilacine; a dark line below vein 2; black marginal streaks between the veins; some lilacine scales on costal margin; an indistinct pale curved inner line; outer line fine, whitish on costal margin, shaded with reddish brown on inner margin; spots small, blackish, a broad subterminal reddish brown shade below vein 4; an interrupted black terminal line inwardly shaded with white. Underneath: a black and white subterminal spot above vein 7. Expanse 33 mm.

Habitat.—Aroa, Venezuela.

Hypena gozama.—Head and thorax brown. Abdomen and secondaries light brown, the latter with a dark terminal line. Primaries brown; the inner margin to below cell and the costal margin from end of cell to apex strongly lilacine, irrorated thinly with black; lines reddish brown; inner line angled on subcostal, twice curved below cell; outer line wavily curved around cell, then parallel with inner line; orbicular as a black point; reniform lunular, dark, filled in with lilacine; a subterminal curved row of black spots; a brown terminal line. No spots on primaries underneath. Expanse 28 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Hypena tossalis.—Head and thorax dark brown, irrorated with black and lilacine. Abdomen and secondaries dull dark brown. Primaries brown; costal margin irrorated with black and lilacine to outer line; inner line oblique from costa, angled above submedian, geminate, lilacine buff, filled in with reddish brown; on basal part a black streak above cell, one below it, and a black spot within angle of inner line; base of inner margin tinged with violaceous; orbicular as a black point; reniform lunular, shaded on either side with grey, and preceded in cell by a black spot; a black streak below cell; outer line wavy, reddish brown, edged with lilacine buff from costa to vein 3, then outwardly with black to submedian, and on inner margin with lilacine on either side; outer margin to just above vein 4 lilacine, except a small light brown space at angle; some subterminal whitish spots; apex from outer line whitish, with brown streaks and a black spot; this pale space followed posteriorly with brown to below vein 5; a crenulate terminal black line. Underneath a white spot above vein 7 and one below it, both preceded by a black spot. Expanse 33 mm.

Habitat.—Jalapa, Mexico.

Hypena uvalis.—Body light greyish brown. Primaries light brown, somewhat tinged with lilacine; a large dark brown space resting on costal margin limited by a pale line oblique from costa near base to submedian beyond middle, then gently curved to costal margin at three-fourths from base; a dark shade from below apex on outer margin to inner margin. Secondaries white; the outer margin black, widest at apex. Expanse 31 mm.

Habitat.—Bolivia.

Hypena gueenealis.—Head and thorax reddish brown. Abdomen and secondaries dull grey brown, the fringe on latter reddish brown. Primaries red-

dish brown; inner line broad, white, oblique from costa near base to submedian near middle, divided by a black line and broadly shaded inwardly with black below cell; some black irrorations on costa; orbicular black, oblique; reniform grey, crossed by a faint black line and preceded by some darker brown shades; outer line whitish, geminate on costa, slightly curved, broadly shaded with grey outwardly to submedian, and separated from the grey by a black line beyond cell, and a black line from vein 3 to submedian; the grey shade outwardly dentate; a white shade thence to apex, on which is a black streak and some brown shadings; subterminal black spots; a black streak above vein 5; an interrupted dark terminal line shaded with white towards apex. Underneath a white apical spot, preceded by a black spot, and divided by vein 8. Expanse 28 mm.

Habitat.—Orizaba, Mexico.

Hypena coatalis.—Head and thorax dark grey. Abdomen and secondaries dull greyish brown. Primaries dark lilacine grey; inner margin green-grey, without markings; an oblique pale streak from costa near base to middle of submedian, divided by a reddish brown line; some black irrorations below cell at base; outer line pale, wavy, curved around cell to inner line on submedian, shaded inwardly with reddish brown, and followed by a darker grey line; a subterminal dark grey lunular shade; a buff and whitish apical space, on which is a black streak; a fine terminal dark brown line. Underneath: a minute white spot below vein 8. Expanse 30 mm.

Habitat.—Jalapa, Mexico.

Hypena peruvialis.—Head and thorax brown, mottled with grey. Abdomen and secondaries dull dark brown. Primaries grey-brown, thinly irrorated with black; inner line oblique, geminate, black, from costa near base to submedian, interrupted in cell; orbicular small, brown-black, followed by a larger similar spot; the reniform linear; outer line wavy, nearly straight, reddish brown, shaded with black-brown between vein 2 and submedian; subterminal white spots below vein 4; long dark streaks above veins 4 and 5, and a short one above vein 6; a white apical space mottled with brown, on which is a black streak; a terminal blackish line; fringe dark grey, with pale lines and spots. Underneath: four subterminal white spots above vein 6 to costa. Expanse 31 mm.

Habitat.—Peru.

Hypena claxalis.—Head and thorax reddish brown. Abdomen and secondaries dull dark brown. Primaries brown; a pale streak from costa near base to middle of submedian, divided by a brown line; outer line wavy, toothed below vein 2, incurved on submedian, brown, finely edged with lilacine white, and broadly shaded outwardly with lilacine, which is limited by a dark curved line; the outer line is inwardly edged with black from vein 3 to inner margin; median space between lines and below cell darker brown; outer margin shaded with grey; subterminal white spots inwardly shaded with black; the two spots preceding an apical buff streak most noticeable; a large blackish brown spot between vein 2 and submedian close to margin; a terminal wavy dark line preceded by some buff shades. Underneath a whitish spot above and one below vein 7. Expanse 35 mm.

Habitat.—Bolivia.

Hypena turalis.—Body and secondaries brown. Primaries brown, irrorated with black and olivaceous brown; a fine dark inner line, crenulate and curved, followed by an oblique lilacine shade, beyond which below cell and vein 2 is a dark brown shade to outer line; orbicular small, black; reniform dark grey, partly edged with pale reddish brown; outer line dark brown, fine, incurved below cell and on inner margin, followed by a broad dark grey shade below vein 5, and above vein 5 by a roseate brown shade; an apical roseate brown space; some dark subterminal spots, outwardly shaded with light brown; a terminal dark line preceded by light brown shades between the veins. Expanse 33 mm.

Habitat.—Castro, Parana.

Hypena braziliensis.—Body buff, the thorax mottled with brown. Primaries buff; the costal and outer margins irrorated with brown, an inner and a median dark shade on costa; outer line curved, finely lunular, black; a broad dark brown shade on inner margin from near base to outer line, then narrower and oblique to apex; a black streak on this brown space above submedian and two black subapical spots; reniform as a black point; some terminal black spots. Secondaries brown grey, whitish on costal margin; a dark median line, outwardly buff; fringe dark buff. Expanse 26 mm.

Habitat.—Rio Janeiro.

Hypena veltalis.—Head, thorax and primaries violaceous brown. Abdomen and secondaries dull brown. Primaries thinly irrorated with black, darkest on outer margin; lines fine, reddish brown, slightly irrorated with white scales; inner line curved obliquely; outer line incurved below cell and on inner margin; a black point at base of cell; orbicular a black point; reniform as a white point, preceded by the darker median transverse shade; subterminal black points outwardly shaded with white; an interrupted terminal black line, preceded by light brown spots; fringe dark grey, spotted with light brown. Expanse 28 mm.

Habitat.—Castro, Parana.

Hypena demonalis.—Body and wings very dark brown; the outer margins nearly black. Primaries: lines still darker; the inner line faintly shaded inwardly with pale violaceous brown, slightly curved; outer line nearly straight, outwardly shaded with lighter brown; an irregular subterminal row of small white spots. Expanse 31 mm.

Habitat.—Bolivia.

Hypena evanalis.—Palpi violaceous brown. Head and thorax grey-brown. Abdomen and secondaries pale grey-brown. Primaries grey-brown, thinly irrorated on median space with large black scales; an indistinct fine reddish brown outer line, angled beyond cell, then oblique to middle of inner margin; small subterminal dark brown spots; an interrupted dark brown terminal line. No spots underneath. Expanse 26 mm.

Habitat.—Peru.

Hypena? ricalis.—Palpi dark brown. Thorax and abdomen light brown. Primaries greenish buff, with paler transverse striæ; base lilacine brown, limited by a broad dark brown line; reniform large, greyish; outer margin dark grey, limited by a fine black line from apex running below vein 7, then curved and slightly undulate to inner margin; between veins 6 and 7 this line is broadly black, with a buff spot on it; a fine dark subterminal line on this grey space. Secondaries brown, shaded with dark grey on costal and outer margin; a black line at anal angle. Expanse 24 mm.

Habitat.—Costa Rica.

Hypena? lignealis.—Head and thorax light reddish brown. Abdomen and secondaries dark greyish brown. Primaries buff, irrorated with reddish brown and dark lilacine; an inner darker shade on costa; a dark streak in cell; an angular blackish line at end of cell; from costa near apex a dark brown curved line to middle of inner margin, broadly shaded inwardly with reddish brown, and then with dark lilacine, outwardly narrowly with buff, and then by a fine dark grey line; a subterminal reddish brown line inwardly shaded with black, heavily between veins 2 and 4, and 6 and 7; a black apical spot inwardly shaded with buff; a terminal dark line. Secondaries: a pale indistinct outer line. Expanse 29 mm.

Habitat.—Rio Janeiro.

CHRYSAUGINÆ.

Gephyra costinotata.—Head, thorax and primaries light brown. Abdomen and secondaries greyish brown. Primaries: a large white spot on middle of costa; a short oblique white streak on costa at outer line, which is pale, oblique, crenulate, shaded on either side with slightly darker brown; an oblique dark median shade from cell to inner margin; outer margin shaded with dark glossy grey. Expanse 17 mm.

Habitat.—Peru.

Gephyra galgula.—♂. Head and thorax brown. Abdomen and secondaries dark greyish brown. Primaries brown; the median space broadly darker, tinged with red, especially on inner margin; a white spot on costa before apex; fringe terminally buff below apex and above inner angle; minute white terminal points.

♀. –More uniformly brown, with a faint paler curved outer line on primaries. Expanse ♂ 15 mm.; ♀ 17 mm.

Habitat.—Castro, Parana.

Salobrena phyrea.—Body brown, vertex buff. Wings glossy brown. Primaries slightly tinged with violaceous; a dark inner line curved on costa; outer line obliquely depressed, white on costa, then dark brown, angled and nearly straight to inner margin, a yellow spot on incision nearest apex; a subterminal dark shade. Expanse 17 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Sanguesa dyopsata.—Head, thorax and primaries lilacine brown. Primaries: a glandular patch of scales below cell near base; a metallic steel blue line from costa at two-thirds from base, to inner angle; apex dark, shaded with steel-blue; fringe with a basal pale line. Secondaries buff, irrorated with brown, especially on outer margin; a steel-blue spot at end of vein 2. Expanse 17 mm.

Habitat.—Jalapa, Mexico.

Tosale grandis.—♂. Head and thorax brown. Abdomen duller. Primaries brown, tinged with red; a pale wavy inner line, followed closely by a parallel black shade; a fine pale outer line to inner angle, slightly incurved above the inner margin and inwardly shaded with black; fringe black. Secondaries dull brown; a large round black patch above vein 2 to close to costal margin and apex.

♀.—Lighter brown. Primaries: the inner line straighter, not followed by black; the outer line with black points inwardly on veins; outer space darker; the outer margin shaded with dark grey. Secondaries and fringe duller; a pale outer line; a dark line on base of fringe. Expanse ♂ 18 mm.; ♀ 21 mm.

Habitat.—Coatepec, Paso de San Juan, Mexico.

Anisothrix grenadensis.—Head, thorax and primaries dull reddish brown. Abdomen black. Secondaries dull brown-black. Primaries: an inner and an outer indistinct paler line, the former obliquely curved, the latter hardly curved. Expanse 20 mm.

Habitat.—Grenada, B. W. I.

Nachaba flnella.—Palpi, head and collar buff. Thorax violaceous. Abdomen black-grey. Primaries dark red, shaded with violaceous on inner and outer margin; outer half of costal margin yellow, partly irrorated with red; an inner and an outer fine dark line, becoming thicker and suffusing below cell; a small dark discal spot. Secondaries dark brown; a pale line at base of fringe. Expanse 14 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Nachaba aromalis.—Head and outer half of primaries light reddish brown. Thorax and basal half of primaries brighter, violaceous. Body light olivaceous brown. Primaries: an inner yellow band from just below costa to inner margin where it is widest. Secondaries bright ochreous, shaded with reddish brown on outer margin and about vein 2; the fringe violaceous. Expanse 18 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Nachaba aronya.—Palpi, thorax and primaries violaceous brown, head paler. Abdomen ochreous brown. Primaries: costal and inner margins shaded with reddish brown; a fine white outer line, curved, chiefly noticeable on middle of costa; a white spot beyond on costa, some white spots on outer margin below apex. Secondaries bright ochreous brown; fringe violaceous brown Expense 20 mm.

Habitat.—Aroa, Venezuela.

Nachaba? violascens.—Palpi blackish grey. Head and thorax lilacine brown. Abdomen dull brown. Primaries brown, slightly tinged with violaceous; at apex slightly golden brown; hairy tuft on costa dark lilacine; an inner and outer dark brown line, the former noticeable below cell, the latter quadrate beyond cell, straight below vein 2; fringe and a terminal line violaceous. Secondaries dull brown; a violaceous brown shade at vein 2, widening to outer margin, and crossed by an outer line not visible elsewhere; fringe violaceous. Expanse 25 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Bonchis magnalis.—Body grey-brown. Primaries grey-brown; a median pale line inwardly shaded with darker brown, inwardly oblique from costa to subcostal, then twice curved outwardly to inner margin; a pale outer line broadly shaded inwardly with golden brown, outwardly oblique from margins, slightly incurved between veins 2 and 5, and followed at vein 7 by a small velvety brown spot; terminal black points. Secondaries thinly scaled, whitish; the costal margin and apex broadly brown; a punctiform outer line; some darker shades on outer margin and a terminal dark line. Expanse 26 mm.

Habitat.—Jalapa, Mexico.

Catadupa viridiplaga.—Head and thorax lilacine brown. Abdomen light silky brown. Primaries lilacine brown; a large olive-green spot near base from subcostal to inner margin, finely edged with lilacine buff; this spot is oval, except a slight indentation on basal side; a smaller round green spot on costal margin above it; a round greyish buff spot at end of the cell, partly surrounded with reddish brown; traces of a median reddish brown angular shade; a pale outer line outwardly curved beyond cell, incurved at vein 2, inwardly shaded with dark violaceous grey; a reddish brown subterminal shade. Secondaries: lilacine brown; a dark streak below vein 2, cut by a pale transverse outer line, inwardly shaded with violaceous. Expanse 29 mm.

Habitat.—Castro, Parana.

Tetraschistis paula.—Body and primaries light brown, the latter crossed by two fine black lines; the inner line slightly wavy, followed by a black point in cell and a small spot on costa; the outer line curved, dentate, followed by some black irrorations; a black point at end of cell on outer line; a black terminal line. Secondaries whitish buff, thinly irrorated with brown on outer half. Expanse 27 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Caphys titana.—Head and thorax roseate. Primaries roseate, crossed by two white lines, one just before middle of wing, slightly oblique, the other straight at a little beyond two-thirds from base. Secondaries whitish buff on basal half, the outer margin tinged with roseate. Expanse 47 mm.

Habitat.—Jalapa, Mexico.

Semnia mexicanalis.—Body blackish brown. Primaries dark violaceous brown; a round deep yellow spot near base above inner margin. Secondaries orange; the outer margin blackish brown to vein 2. Expanse 25 mm.

Habitat.—Paso de San Juan, Mexico.

Semnia? mirma.—Head and thorax light grey brown. Abdomen and secondaries darker brown. Primaries: base to median band light reddish brown, and a similar narrow shade beyond the median band, which is very dark brown, edged on either side with white, and is outwardly angled on median vein, and less so just above the submedian; outer margin brown, shaded with a large lilacine space from vein 3 to apex; a terminal dark brown line on both wings. Expanse 20 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Eurypta viridis.—Head and thorax dark greyish brown. Abdomen light brown. Primaries green; a broad brown band from middle of costa, broadening at median to vein 4, then becoming narrower to inner margin before angle; basal half of costa, base of wing and inner margin narrowly brown; a terminal brown line; fringe grey, crossed by a black line. Secondaries: the costal half brown; the inner half ochreous; a brown streak below vein 2; a green patch on outer margin at vein 2; a brown terminal line. Expanse 21 mm.

Habitat.—Castro, Parana.

Semniomima mediana.—Head yellowish; a grey spot on frons. Body and wings light brown. Wings crossed by a median yellow space, widest on costa of primaries and outer margin of secondaries. Fringe on primaries dark grey, on secondaries buff, crossed by a dark grey line. Expanse 22 mm.

Habitat.—Castro, Parana.

Chrysauge jonesalis.—Body brown-black. Wings bright yellow. Primaries; the margins narrowly black; a broader black band from middle of costal to inner angle. Secondaries: outer margin narrowly black; the apex broadly black. Expanse 30 mm.

Habitat.—Castro, Parana.

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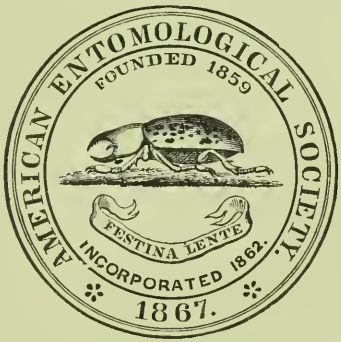

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THE HYPOPYGIUM OF THE TIPULIDÆ.

BY ROBERT E. SNODGRASS, Stanford University, California.

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INTRODUCTION.

The material from which this paper has been prepared is a large collection of Tipulidæ, belonging to the Biology Department of the Washington Agricultural College. The collection was classified and arranged by Mr. R. W. Doane, formerly assistant entomologist at the College and Experiment Station, and contains the types of Mr. Doane's new species of Tipulidæ published in several papers. The names used in the present paper are according to Mr. Doane's identifications.

In two other papers* on Dipteran hypopygiums, the writer has restricted the application of the word *hypopygium* to the ninth abdominal segment only. The same usage will be adhered to in this

* Psyche, vol. ix, pp. 339, 400.—The Inveiled Hypopygium of *Dasyllis* and *Laphria;* and Proc. Cal. Acad. Sci. (MS.).—The Hypopygium of the Dolichopodidæ.

paper. The word has generally been used to signify the entire posterior enlargement of the male abdomen. Since, however, this is an extremely variable structure, and since, also, in many insects there is no enlargement of the abdomen, the word used in this fashion must have a very indefinite meaning, or none at all when the male genital parts do not form an enlargement. "The hypopygium" would, within the same genus, in some cases mean one segment and in other cases mean several segments. Within the same family some genera would have large hypopygiums and others none at all. Hence, it seems best, in order to give the term a definite significance, to make it mean the genital segment of the male, *i. e.*, the segment that carries the intromittent and clasping organs. This is, in all insects, the ninth segment of the abdomen. The etymology of the word is such that the derivational meaning may be disregarded.

The general shape of the hypopygium in the family Tipulidæ is that of a cup opening posteriorly. The cavity of the cup is the *genital chamber*. It is produced simply by the invagination of the posterior face of the segment. This carries into the depression the tenth segment, which morphologically terminates the abdomen. The tenth segment, bearing the anus at its end, is reduced to a small membranous tube, or to a simple prominence, arising from the upper part of the anterior wall of the genital chamber. It sel dom projects much beyond the hypopygium.

Attached to the posterior rim of the hypopygium are from one to three lobe-like appendages on each side. These are called the *apical appendages*. The body of the segment is made up of four plates, one dorsal, two lateral and one ventral. It is evident that the dor sal plate is simply the tergum and that the ventral plate is the sternum of the segment. The lateral plates vary greatly in position, but in two groups of genera, from each of which a line of more specialized genera may be derived, these plates occupy a typically pleu ral position. That is, they extend along the entire length of the segment, one on each side, between the tergum and the sternum. On this account they will be given here the name of *pleura*. This name is adopted, however, simply on a basis of analogy. But probably many names applied to different parts of the external anatomy of insects have no basis in homology. In our present ignorance of the external homologies of insects, there is no need to make a new word when "pleural" may refer to any plate intervening on the side of the segment between the tergum and the sternum.

In the lower genera, as just stated, the pleura lie in their normal position, one on each side of the segment, between the tergum and the sternum. In other genera, however, they may be either exserted upon the posterior rim of the segment, or form a small plate set into the posterior rim, or they may be absent entirely.

In the genus *Tipula* the pleura are never very conspicuous and are in many species entirely absent. Westhoff, in his paper on the hypopygium of *Tipula*,* almost entirely overlooks them. He regards the hypopygium as being formed of both the eighth and the ninth segments of the abdomen, and applies the following names to the different parts: the eighth tergum he calls the *lamella basalis supera*, the eighth sternum the *lamella basalis infera*, the ninth tergum the *lamella terminalis supera*, and the ninth sternum the *lamella terminalis infera*. But what is the use of employing such long and cumbrous terms when we already have the shorter names of *eighth tergum*, *eighth sternum*, etc. ?

In the lower genera the penis arises from the floor of the genital chamber and projects straight backward as a slender rod. In the genera of the Tipulina the base is carried up the anterior, and on to the dorsal, wall of the chamber. The penis in this case extends in a large curve down the anterior wall and then posteriorly along the floor of the genital chamber, its terminal part retaining the original position. The basal part in these forms is greatly swollen, forming a hemispherical vesicle. This is the *vesicula centralis* of Dufour. This name is used also by Westhoff, and in its anglicized form of *central vesicle* is employed in this paper.

The terminal part of the penis is in all cases protected by a guard. This has typically the form of two longitudinal plates set close together and on edge, projecting caudally from their origin on the floor of the genital chamber, and having their lower edges united by membrane. Numerous modifications of, and departures from, this typical form occur. The guard may be a solid cylindrical or plate like structure, with simply a longitudinal groove above to accommodate the penis, or it may be a hollow cylinder or tube entirely inclosing the penis within it. It is called by Westhoff the *adminiculum*.

In most of the lower species there project backward from the an-

* Westhoff, Friedrich, Ueber den Bau des Hypopygiums der Gattung *Tipula* Meigen, Inaug-Diss., Münster, 1882.

terior wall of the genital chamber, just above the guard of the penis, two elongate, free, chitinous rods. Each of these is very commonly forked. The word *gonapophyses* has been used by various describers of insect anatomy to designate four free rods that arise from the wall of the genital chamber, two above and two below the base of the penis, and project backward within the chamber. The application of the name "gonapophyses" to these rods is, very likely, a misnomer from the standpoint of homology. However, since it has been so used the writer will not here attempt to use a new word.

The guard of the penis is, as already stated, very often a solid structure with simply a lengthwise groove above; but, in a great many cases, it consists of two slender plates set on edge side by side and united by membrane along their lower margins. This structure would suggest that it may have been formed from two plate-like processes, extending backward from beneath the penis, whose lower edges became connected by membrane. In this case there would have originally been a pair of processes projecting caudally above the penis and another pair below it. This would be exactly the condition that exists in many forms of Diptera, *e. g.* in the Muscidæ. Hence, we can imagine, at least, that the guard of the penis and the two gonapophyses of the Tipulidæ represent the four gonapophyses of some other families. For this reason the Tipulid gonapophyses will be referred to in this paper as the posterior or second gonapophyses. The simple relationship of gonapophyses, penis and guard is seen best in the Tipulid genera below the group Tipulina, where the penis is a short, straight, rod-like tube.

As will be seen from the specific descriptions given beyond, and in the conclusion at the end of this paper, the structure of the hypopygium affords a good basis for determining not only the relationships of the larger groups of the family to one another, but also that of genera within the groups and of species in the genera. Furthermore, the minor features of the hypopygium, and especially the shape of the apical appendages, make most excellent specific characters. In the collection of Tipulidæ, from which this paper is prepared, a large number of specimens of the genus *Antocha* were placed together and labelled *A. opalizans*. Externally they are all very similar, except that some (Pl. VIII, fig. 5) have the pleural plates a little larger than others. However, it was found that in the former the guard of the penis has the form shown in fig. 8, while in

the latter that represented by fig. 6. Hence there were here confused two decidedly distinct species.

The objection to using hypopygial characters in specific descriptions is that the characters are hard to get at, and that their study involves the mutilation of specimens. When studying a dried specimen, one must break off the end of the abdomen, boil it in water until soft, and then dissect under a simple microscope and examine some parts under a compound microscope. Drawings must be made of all the parts, for differences are often such that descriptions alone would be inadequate. Here another difficulty arises, for the same parts often have very different appearances when placed in but slightly different positions. Yet the specific differences are in these parts so strongly and definitely marked that their study would certainly repay the expenditure of a great deal of time and patience. A specimen having the end of the abdomen broken off is worth just as much as an unmutilated specimen, which, by its very perfection, forbids the student any knowledge of its structure. If drawings and descriptions are made of the removed parts, then the mutilated specimen has certainly done more for science than the perfect one ever can do.

Genus **ANTOCHA.**

The structure of the hypopygium is undoubtedly more primitive in this genus than in any other examined by the writer. Other genera, such as *Rhamphidia* and *Dicranoptycha* of the group Limnobina Anomala, which is Osten Sacken's Section II of the Tipulidæ, do not show this simplicity of structure. The hypopygium of *Antocha* is even more simple than in the genera of Osten Sacken's Section I—the *Limnobina;* hence it is here described first.

Antocha opalizans O. S. (Pl. VIII, figs. 5, 8. 11).

Abdomen slender, hypopygium scarcely forming an enlargement. Eighth segment very simple; tergum and sternum subequal, forming a simple ring widest on the middle of the sides (fig. 5, viii).

The hypopygium is of primitive form, consisting of a tergal plate above, a sternal plate below, and of a large pleural plate on each side between the tergum and sternum (fig. 5, ix, *t*, *p*, *s*). The posterior face of the segment is deeply concave, forming a cup-shaped cavity, the *genital chamber*. In it are situated the penis and its guard, the gonapophyses, and the rudimentary tenth segment.

The tergum of the hypopygium is a triangular plate, with the apex directed caudad. The sternum is similar in shape to the tergum, but is larger. The tergum and sternum are widely separated on the sides of the segment by the very large pleura. Each of these plates is oval or rhomboidal, strongly convex on the outer surface, and bears distally, on the inner face, a long, densely chitinous, bent, blunt spine directed inward and forward. All species of the Tipulidæ have lobes of some sort born on the ends of the pleura; these are collectively termed the *apical appendages*.

The guard of the penis (fig. 8) is a large flat plate on the floor of the genital chamber. The anterior margin is deeply emarginate, its posterior margin graduated and produced medially into a short blunt process. A deep groove extends along the mid dorsal line of both the body of the plate and the posterior prolongation. The penis most probably resembles that of the following species and lies in the groove of the guard. It was not found in the specimens dissected.

Arising from the lateral walls of the genital chamber there is, on each side, a biramous appendage, shown in fig. 11. The upper arm is the longer and has its distal half bent upward. The lower arm projects downward and caudad, and then is curved upward. The recurved parts of the two lower arms lie in the notch on the anterior edge of the guard of the penis. These two bifid processes are here, as explained in the introduction, tentatively called the *second gonapophyses*. The guard of the penis is regarded as being formed of two rami converging and fusing beneath the penis, which constitute the *first gonapophyses*.

Antocha sp. inc. (Pl. VIII, figs. 3, 6, 7).

This species is very similar to the last, but the hypopygium differs externally in having the pleural lobes slenderer and less convex. The tergum also is widely truncate and concave posteriorly. The apical appendages are two in number on each side, and they are thicker than in *A. opalizans*.

The internal parts of the hypopygium differ more in the two species than do the outer parts. The guard of the penis consists of a small triangular plate, with the lateral edges turned up so as to make a short triangular trough in which lies the distal half of the penis. From the basal angles there diverge anteriorly two wide flat arms (fig. 6).

The penis (fig. 3) can be, in this species, very easily isolated. It is a short, thick, semi chitinous rod, expanded slightly at the middle and ending in a small enlargement. It arises from a biramous, expanded base between the arms of the guard.

The second gonapophyses have the same essential structure as in *A. opalizans*. Here, however, the lower arm of each is the larger, and is strongly bent upward beyond the middle (fig. 7). The upper arm is nearly straight and bears a small process distally on the upper margin.

Genus **DICRANOMYIA.**

In this genus the sternum of the hypopygium is rudimentary. The pleura are large and reach the anterior margin of the segment. The apical appendages are large expanded lobes.

Dicranomyia longipennis Schum. (Pl. VIII, figs. 2, 4).

The abdomen is slender, the hypopygium forms a small oval enlargement. The eighth segment is very narrow, the dorsal part being a mere transverse band, the sternal part is larger but simple.

The tergum of the hypopygium is a large trapezoidal plate with the wider base anterior. The pleura are large ovoid plates strongly convex outwardly, reaching the anterior margin of the segment and projecting posteriorly far beyond the tergum. The sternum is membranous and rudimentary (fig. 4).

There are two apical appendages on each side, one ventral, the other dorsal. The ventral one is a large pale oval lobe, as large as the pleurum itself. From its inner basal angle there projects inward and forward a slender arm that bears terminally two long bristle like spines projecting posteriorly. The dorsal appendage has the form of a long curved sickle-like hook (fig. 4).

The guard of the penis is an elongate structure strongly decurved at the tip (fig. 2, *p*, *g*). Basally it is prolonged into two slender divergent arms implanted in the membranous floor of the genital chamber. The penis is simply a curved rod-like tube, somewhat thickened toward the base, arising immediately before the base of the guard between its two roots.

The second or upper gonapophyses arise from the anterior wall of the genital chamber. They are simply two thin triangular plates set vertically over the guard. Each has the tip prolonged into a small up curved hook (fig. 2, *gon. 2*).

Dicranomyia venusta Berg. (Pl. VIII, fig. 1).

This species is very similar to *D. longipennis*. The eighth segment, however, is much larger, its sternum is considerably prolonged beyond the tergum (fig. 1), giving an upward bend to the end of the abdomen.

The tergum of the hypopygium rises almost vertically from the eighth tergum. The pleura are large, each with a prominent lobe near the distal end of the lower margin. The sternum is rudimentary.

The guard of the penis and the penis are almost identical with those of the last species. The guard is apparently a closed tube surrounding the penis, at least, a careful examination revealed no groove or even a suture along the dorsal line. If a specimen be allowed to dry and then examined in liquid, the space around the penis within the guard will be seen filled with air.

The second gonapophyses are thin vertical plates projecting backward from the front wall of the genital chamber. The distal convex edge of each bears an up turned hook at the middle.

Genus **LIMNOBIA** Meigen.

The members of this genus resemble those of *Dicranomyia* in having the hypopygial sternum rudimentary. Both genera belong to Osten Sacken's first group of the Tipulidæ, the Limnobina.

Limnobia sciophila O. S. (Pl. IX, figs. 16, 19, 20).

The abdomen is slender. The hypopygium does not form an enlargement; it is somewhat upturned but is tapering.

The eighth segment is simple, composed of a normal tergum and sternum, the latter a little the larger.

The tergum of the hypopygium is a plain transverse plate, placed almost vertically, but constituting the true dorsal surface of the segment. The pleura are large plates entering the anterior margin of the segment, expanded back of the middle and then again contracted. Each bears distally a large hook like lobe, the apical appendage (figs. 16 and 19), which is greatly swollen at the base and directed inward and forward.

The sternum consists of a narrow bridge uniting the anterior ends of the parallel lower edges of the pleura. From the dorsal side of this bridge arises the penis and its guard. The guard (fig. 20, *p, g*) consists of a median plate grooved along the middle line above, ex-

panded laterally near the base, tapering toward each extremity, ending distally in two deflexed points. The penis is a narrow chitinous tube lying in the groove of the guard, and arising from two diverging roots in front of it.

The second gonapophyses (fig. 20, *gon. 2*) consist of two slender triangular plates projecting into the genital chamber above the guard of the penis, and arising from two long roots that run forward to the base of the guard. These really arise from a more dorsal level than the base of the guard, although not clearly so shown in fig. 20, which is a ventral view of the parts.

The forms that follow the genera so far described, in the structure of the hypopygium, have the pleural plates excluded from the lateral parts of the segment and attached as appendages on its posterior rim. The series thus derived from *Antocha* and the Limnobina are the genera of the Limnobina Anomala exclusive of *Antocha*, the Eriopterina, the Limnophilina, the Anisomerina and the Amalopina. The genera of the Ptychopterina (*Bittacomorpha* and *Ptychoptera*) constitute another group in which the pleura intervene between the tergum and sternum. From them are derived the genera of the Tipulina, with *Pachyrrhina* as a transitional genus, in which the pleura retreat from the anterior margin of the segment but become fused with the sternum.

Genera **RHAMPHIDIA** Meigen, and **DICRANOPTYCHA** O. S.

In both of these genera of the Limnobina Anomala the hypopygium consists of a circular ring-like body, composed of the tergum and sternum, and of two large lobes attached laterally to the posterior rim of this ring. These appendicular lobes are apparently the pleura, for in these genera, and in all the others related to them, they bear distally the apical appendages.

Genera **ERIOPTERA** Meigen, **TRIMICRA** O. S. and **SYMPLECTA** Meigen.

These genera represent Osten Sacken's Section III, the Eriopterina. They resemble the last two in that the body of the hypopygium is ring like, and the pleura are appendicular.

Erioptera septentrionis O. S.

The body of the hypopygium consists of a simple ring in which there is not even a suture between the tergum and sternum. The

genital chamber is a wide open cup shaped invagination of the posterior face of the segment.

The tergal part of the hypopygium is prolonged posteriorly beyond the lateral parts as a quadrate lobe with the caudal margin emarginate. The pleural lobes are large, convex outwardly, slightly narrowed at the distal end and roundly truncate. Two apical appendages arise from the inner face of each pleurum near its distal end. The more dorsal one is short and spatulate, and has a strong sharp hook arising from its base. The inferior one is a long, slender, strongly chitinous, tapering, knife like blade. Both are directed inward and forward.

The guard of the penis is plate-like. The second gonapophyses are forked appendages arising above the guard from the sides of the genital chamber.

Trimicra anomala O. S. (Pl. VIII, fig. 9).

The hypopygium of this species is very similar to that of the last. The pleural plates, however, are larger and give a more expanded appearance to the end of the abdomen.

The tergal part of the hypopygium is somewhat produced posteriorly as a truncate plate (fig. 9). The sternal margin is entire and slightly convex. There are no sutures between the tergum and sternum. The pleura are very large oval lobes, strongly convex on all sides, and widely divergent (fig. 9). One large curved finger-like process, with a sharp and strongly chitinized tip, projects inward and forward from the apex.

The guard of the penis (fig. 9, *p*, *g*) is an elongate triangular process, grooved above, arising from the floor of the genital chamber and mostly projecting out of the latter posteriorly.

The second gonapophyses (fig. 9, *gon. 2*) are strong hooked processes arising from the walls of the genital chamber above the base of the guard.

Symplecta punctipennis Meigen (Pl. VIII, figs. 10, 12).

The abdomen is slender. The body of the hypopygium is narrower than the preceding segments, but the flaring pleural lobes stand out prominently at the end of the abdomen. The eighth segment is very short (fig. 12).

The body of the hypopygium is ring like, with no sutures between tergum and sternum. The sternal part is concave on the posterior

border. On the tergal aspect the chitinous parts are interrupted medially by a large triangular membranous area anteriorly, connecting with a crescentic membranous area posteriorly (fig. 12). The pleural lobes are large and strongly convex outwardly. Each is somewhat more than twice as long as the body of the hypopygium, and bears on the upper edge, near the distal end, a short, thick, expanded, non-articulated lobe directed inward and forward.

The guard of the penis is a flat plate, with the angles of the posterior truncated end expanded laterally. The second gonapophyses are large and densely chitinized processes (figs. 10 and 12, *gon. 2*) projecting from the sides of the genital chamber above the guard. The free part of each consists of two short thick arms, the inner longer, serrate distally, and blackly chitinous. The two pairs are connected medially by a short transverse process from each, the two uniting to the middle line. Each gonapophyses has a long rod-like apodeme extending forward into the abdominal cavity (fig. 10, *ap.*).

Genus **LIMNOPHILA** Macq.

In the structure of the hypopygium this genus differs in no essential manner from the genera of the Eriopterina. It may be taken as typical of Osten Sacken s fourth group, the Limnophilina.

Limnophila cubitalis O. S. (Pl. IX, fig. 14).

The hypopygium and genital chamber form a simple cup like structure open dorsally and posteriorly. The ventral part of the rim is somewhat produced posteriorly.

From the floor of the genital chamber there projects upward and posteriorly, at an angle of about 45 degrees, a short, thick, tubular structure having a slender, chitinous, brace-like plate running outward from it on each side. This is the penis and the first and second gonapophyses.

The penis itself, when divested of the ensheathing plates and membranes, is seen to be a slender cylindrical tube, arising from an enlarged base on the floor of the genital chamber, and extending posteriorly and upward so that the tip, which is enlarged and bent forward, projects out of the cavity (fig. 14, *p*). It is protected dorsally by two plates that arise near its base and converge and unite upon its tip. Ventrally the penis is protected by two similar plates arising below its base, converging upon the under surface of the tip, but uniting here for a longer distance than do the dorsal plates.

These four plates, arising thus two above and two below the base of the penis, and converging about its tip, apparently are the four gonapophyses.

Limnophila rufibasis O. S. (Pl. IX, figs. 17, 21, 22, 23, 25).

The hypopygium forms but a slight enlargement of the abdomen. The body of it is a narrow ring. The tergal part is deeply notched and the corners of the notch are produced into small blunt points (fig. 23). The pleura are very large lobes, convex on all sides, membranous on the inner surfaces. Each bears distally two apical appendages, one of which (figs. 22, 23) is directed posteriorly and the other inward and anteriorly.

The penis arises from a large biramous base on the floor of the genital chamber (fig. 17, *b*, *p*, fig. 21). Beyond the base it is received into the guard (*p*, *g*). This is a large, compressed, oval structure, with the distal end produced into a decurved prolongation. It is composed of two thin lateral shells continuous with each other below, and united above in a suture, forming thus a capsule entirely enclosing the penis. The latter forms a slender curved tube within the guard.

The second gonapophyses are two long, slender, tapering, decurved rods, arising from the anterior wall of the genital chamber and extending posteriorly a little beyond the guard (fig. 23, *gon. 2*, and fig. 25).

In this species there is a well developed anal tube or tenth segment (fig. 23, *a*, *t*) arising from the roof of the genital chamber and projecting out of it posteriorly.

Limnophila quadrata O. S. (Pl. IX, fig. 18; Pl. X, fig. 34).

The abdomen is slender and cylindrical, the hypopygium does not form an enlargement. The eighth segment is a simple narrow ring.

The body of the hypopygium consists of a perfectly simple ring, wider than the eighth segment, undivided by sutures, having only a wide notch in the posterior margin below. The pleural lobes are somewhat elongate, and each bears terminally two slender, tapering apical appendages directed inward and forward.

The guard of the penis is a long tube greatly swollen in its basal half; slender, cylindrical or tapering and curved upward in its distal half (figs. 18 and 34, *p*, *g*). The length and the curve of the distal half vary considerably in different specimens. In some the

terminal part is simply turned up, in others the distal half curves upward and then forward again. Under the microscope a tube can be seen fitting closely inside of the guard By pressing on the cover glass it can be proved that this appearance is not merely an optical effect, for the outer tube clearly separates from the inner. By breaking the structure apart, however, the two tubes break with such even fractures that they cannot be easily demonstrated in this way. The inner tube is the penis.

Arising from the sides of the genital chamber, and apparently from the inner faces of the pleura, above the base of the guard, are the second gonapophyses. Each is a biramous process, the two arms forming a large angle with each other (fig. 34, *gon. 2*), and is supported by an arm-like apodeme (*ap.*) extending forward and upward.

Genus **EPIPHRAGMA** O. S.

This genus also belongs to the Limnophilina, and presents the same type of structure as *Limnophila*.

Epiphragma fascipennis Say (Pl. IX, figs. 13, 15).

The abdomen is somewhat long and slender. The hypopygium forms only a slight enlargement. The sternum of the eighth segment is much larger than the tergum, and extends posteriorly beneath the ninth segment.

The body of the hypopygium is undivided by sutures; the tergal margin is slightly convex and notched, the sternal margin is entire. The pleura are extraordinarily large triangular lobes, their bases are high and almost meet each other dorsally (fig. 13). Each lobe bears two apical appendages directed inward and forward. The outer and more ventral one is blunt and cylindrical, the other is more dorsal but is mostly concealed by the outer, and is hook-like.

The guard of the penis is a narrow, triangular structure, having the tip somewhat prolonged and curved upward. The penis itself is a short rod-like tube, arising just in front of the base of the guard from two long prong-like roots, resembling the tines of a fork. Between them the ejaculatory duct enters the penis.

The second gonapophyses are of rather curious shape (fig. 15). Each consists of a long, slender, tapering arm lying along the side of the genital chamber, and arising from the lower end of a vertical rod lying against the anterior wall of the genital chamber, and projecting a little out of it dorsally (fig. 13, *gon. 2*). Attached to the

anterior edge of the vertical rod, at about its middle, is a large triangular scapula like apodeme (fig. 15, *ap.*). Only the posterior narrow neck of this plate projects into the genital chamber. The whole structure can be regarded as a bifid rod arising from an apodeme, which is the common form of the second gonapophyses in the genera so far described.

A short, cylindrical anal tube is present.

Genus **ERIOCERA** Macq.

This genus closely resembles *Limnophila* in the structure of the hypopygium. It is here described because it represents the small group Anisomerina, Osten Sacken's Section V.

Eriocera eriophora Wils.

The body of the hypopygium is a simple ring, widest on the sides, very narrow below, constricted above by a posterior emargination. The pleura are large, almost cylindrical lobes, appendicularly attached to the rim of the hypopygium. Each bears distally two long, curved apical appendages directed forward and inward. The convex border of the anterior appendage fits into the concave border of the posterior, giving to the two a beak-like appearance.

Genus **AMALOPIS** Haliday.

This genus may be taken as representative of the group Amalopina. In it the pleura attain their best development as appendages of the rest of the hypopygium. That is, their appendicular condition is most pronounced, and the apical appendages proper are reduced to small processes and hooks.

Amalopis constans Doane (Pl. IX, figs. 24, 26, 31, 32).

The abdomen posteriorly is somewhat tapering. The hypopygium forms a small but abrupt globular enlargement (fig. 32). The tergum of the eighth segment is larger than the sternum.

The hypopygium has the tergum separated by sutures from the sternum. The former is a simple plate with the posterior border gently convex, and slightly notched medially (fig. 26). The sternal margin is medially produced into two small knobs (fig. 24). The pleural are large, thick and subcylindrical (fig. 32). Each is strongly chitinous and very convex on the outer surface, but presents a large irregular, median, non-chitinous area on the inner surface (fig. 31). The distal end is produced into a long median finger-like process,

and into an anterior and a posterior lobe that are shorter and comparatively thicker. Near the distal end of the inner surface each pleurum bears a small two-hooked process. This probably represents the two apical appendages.

Amalopis inconstans O. S.

The parts of the hypopygium are in general very similar to those of the last species. The processes and hooks on the pleura, however, are distinctly different. The posterior or ventral distal angle of each pleurum is elevated into a large rounded lobe. The anterior or dorsal angle is produced into a lengthened spatulate process. Within the latter is a large bifid process projecting forward, upward and inward.

Amalopis ampla Doane (Pl. IX, figs. 27, 28, 29, 30).

The abdomen is cylindrical, the hypopygium forms a conspicuous enlargement at the end. The eighth tergum is short, but the eighth sternum is very long, being much produced posteriorly. On this account the hypopygium is turned upward at an angle of about 45 degrees.

The body of the hypopygium has no sutures between the tergum and sternum. It is somewhat funnel shaped, the posterior rim being wider than the base. The tergal part is produced posteriorly into an oblong, semi chitinous plate ending in two points (fig. 29), and reaching far beyond the lateral and ventral parts of the segment (fig. 30). The sternal margin is widely emarginate (fig. 28). The pleura are large, flat, oblong lobes rising vertically, or inclined forward, from the rim of the genital chamber (figs. 30, 27). Each bears at the distal end six large, hook-like processes. In this species the pleura are decidedly appendicular being attached by narrow bases to the body of the hypopygium.

Genus **PHALACROCERA** Schiner.

This genus is described simply because it is representative of Osten Sacken's Section VII, the Cylindrotomina. The hypopygium is anomalous in some ways and its position in the series is not clear.

Phalacrocera tipulina O. S.

The hypopygium is somewhat box shaped. The tergum is a wide, almost square plate, with a median linear notch behind. The chit-

inous part of the sternum is deeply cleft in the median line posteriorly, but the notch is occupied by membrane. The pleura are fused with the lateral parts of the sternum, but each stands out as a prominent triangular lobe on the posterior rim of the hypopygium. Each carries, articulated to it, a long, slender, tapering process ending in a recurved hook.

The penis and its guard have a most unusual form. The two together appear to constitute one structure composed of a short, thick body bearing three terminal prongs projecting posteriorly and a short spike like process projecting dorsally. Above it are two elongate plates lying against the roof of the genital chamber.

Genera **BITTACOMORPHA** Westw., and **PTYCHOPTERA** Meig.

In these two genera we go back again to the primitive structure of the hypopygium found in *Antocha* and in the Limnobina Anomala, where the pleural plates occur in their normal position on the sides of the segment between the tergum and the sternum. Hence, we have two groups of genera possessing this primitive hypopygial structure. From the first we can derive the series of genera, beginning with *Rhamphidia* and ending with *Amalopis*, in which the pleura are appendicular. From the second group, Section VIII of Osten Sacken, the Ptychopterina, we can derive the genera of the Tipulina, where the pleura again recede from the front of the segment but become fused with the sternum.

Bittacomorpha clavipes Fab. (Pl. X, figs. 35, 36, 37, 38, 39).

The appearance of the hypopygium in side view is shown in figure 35. The eighth segment is here removed and the intersegmental membrane (*m.*) between the eighth segment and the ninth is exposed.

The tergum is a large, wide, strongly convex plate, covering not only the dorsal surface of the hypopygium but also the dorsal half of each lateral surface. The posterior margin is concave above (fig. 37), convex on the sides. Just above each lower posterior angle there is movably articulated to the posterior margin a long slender appendage extending posteriorly and slightly curved inward (figs. 35 and 37, *a*). These appendages are simply special organs in the species, having no recurving homologous representatives elsewhere. Similar lobes occur also in scattered cases on the sternum, as for example, in *Ptychoptera lenis*. The notch on the posterior margin of the tergum is occupied by a narrow fold of membrane in which there is situated a small nodule of chitin.

The sternum has the form of an equilateral triangle with the anterior side convex and the lateral sides concave. It lies mostly upon the ventral side of the hypopygium. The posterior median angle is truncate and emarginate. From the two points thus produced there arises, from two corresponding roots, a large, darkly chitinized, hammer-shaped appendage (fig. 38, *b*).

The tergum and the sternum are separated entirely, on the sides of the segment, by the pleura (fig. 35). Each pleurum is an elongate triangular plate, having anteriorly an uncinate prolongation extending into the intersegmental membrane (*m.*) back of the eighth segment far in front of the tergum and sternum. A chitinous bar arises from the pleurum near its base (fig. 39, *c*), and extends inward, lying in the floor of the genital chamber. Its edges are provided with a number of small teeth. There is only one apical appendage on each side. This is an elongate arm widest at its base, tapering distally and curved inwards. It is born at the distal end of the pleurum.

The guard of the penis is a small elongate triangular structure, apparently enclosing the penis on all sides (fig. 36, *p. g.*). The penis projects from the tip as a small chitinous rod (*p.*). In front of the base of the guard are two pairs of small chitinous points arising from the floor of the genital chamber, which may represent the bifid second gonapophyses.

Ptychoptera lenis O. S. (Pl. X, figs. 40, 41, 42, 43, 45).

The hypopygium forms a small globular swelling at the end of the abdomen. The eighth segment is normal, the sternum is longer than the tergum (fig. 40).

The body of the hypopygium is formed of a large dorsal and dorso-lateral tergum, a ventral and ventro-lateral sternum, and two small pleural plates, one on each side between the tergum and the sternum. The tergum is deeply notched medially (fig. 41), so that the median part forms simply an anterior bridge connecting the two large lateral lobes. Each of the latter is strongly convex laterally, concave on the inner edge and produced here into a larger posterior and a smaller anterior lobe. The sternum is a simple plate, widest on each side where it forms the lower lateral surface of the segment (fig. 40). Each of these lateral parts carries on its posterior edge a large articulated lobe (fig. 40, *l.*, and fig. 44) extending upward and

posteriorly, the dorsal end being hidden between the apical appendages. Each pleurum is a small, elongate, triangular plate lying along the middle of the side of the segment. Its anterior end does not quite reach the anterior margin of the hypopygium. A narrow tapering bar runs downward from the anterior angle of the tergum and meets a similar bar running upward from the corresponding angle of the sternum. There is formed thus a narrow bridge uniting the tergum and the sternum in front of the pleurum. The posterior end of the pleurum projects as a small rounded lobe into the angle between the tergum and the sternum, and carries the apical appendage (fig. 40). There is only one apical appendage on each side. Each is a long, slender, inwardly curved, club shaped lobe projecting posteriorly and upward (fig. 40, *ap.* and fig. 45).

The guard of the penis consists of two elongate, blade-like plates set on edge side by side, arising from the floor of the genital chamber. Their lower margins are united by membrane, so that there is thus formed between the two plates a deep narrow groove. This lodges the penis. The latter is a simple, short, straight, rod-like tube, arising from two diverging roots from the lower part of the anterior wall of the genital chamber. The second gonapophyses arise from the anterior wall of the genital chamber. Each is a short blade like plate much resembling a half of the guard of the penis and like it set on edge. In this genus, therefore, the penis and the gonapophyses are much more nearly primitive than in *Antocha*. If the lower edges of the sides of the guard were not united, we should have the simple condition of the penis surrounded by a pair of processes above it and a similar pair below it.

Group **TIPULINA.**

The group Tipulina is Osten Sacken's Section IX of the Tipulidæ. It includes, besides several other genera, the following genera which are described in this paper: *Pachyrrhina*, *Tipula* and *Ctenophora*. It undoubtedly belongs at the top of the family. In certain characters of the hypopygium the members are highly specialized and differ uniformly from all the other genera.

The characteristic features of the group, in the structure of the hypopygium, are: (1) the fusion of the pleura with the sternum; (2) the shifting of the base of the penis from the floor to the roof of the genital chamber, and the elongation of the penis in a large curve

forward; and (3) the thickening of the base of the penis to form a *central vesicle*. Less distinctive characters are the disappearance of the second gonapophyses, and the presence in most of the species of three apical appendages on each side.

The fusion of the pleura with the sternum is perfect in *Ctenophora* and in many of the members of *Tipula*. In *Pachyrrhina* the condition is more primitive. In one species (*P. polymera*, Pl. XI. fig. 60) the suture between the pleurum and the sternum on each side extends to the anterior margin of the segment, but near the anterior end it is simply a groove. All the other species of *Pachyrrhina* examined have this suture ending some distance back of the anterior margin of the segment. The suture may have a simple termination as in *P. lugens* (Pl. XI, fig. 51), or, as in more general, the anterior end may be abruptly bent upward, as in *P. incurva*, *P. ferruginea* and *P. pedunculata* (Pl. XI, figs. 53, 56, 59). In many species of *Tipula* this vertical arm of the suture is extended upward to the tergal suture, thus cutting off a plate, generally having a triangular shape, set into the posterior margin of the segment, between the tergum and the sternum and carrying the apical appendages. In these forms, then, the condition of the pleurum is intermediate between that of *Antocha*, *Dicranomyia*, *Bittacomorpha*, etc., where the pleurum has the normal position between the tergum and sternum, and that of *Erioptera*, *Limnophila*, *Amalopis*, etc., where the pleurum is an exserted lobe upon the posterior rim of the hypopygium. The arrangement of the genera in such a sequence, however, is precluded by the structure of the penis and other organs.

In the lower genera of the Tipulidæ the penis has the form of a short straight rod, generally arising from two diverging root like arms (*e. g.* see *Antocha*, fig. 3; *Limnophila*, fig. 21; *Ptychoptera*, fig. 42). In the Tipulina the penis has a very different appearance. It arises from a large, swollen, darkly chitinous vesicle, the *central vesicle* situated on the roof of the genital chamber (see section of *Tipula angustipennis*, Pl. XVII, fig. 149, *c. v.*). From the anterior end of this vesicle the penis curves forward and downward close to the anterior wall of the genital chamber, and then goes posteriorly on its floor (fig. 149, *p.*). Often it goes far forward in the abdomen within a special prolongation of the genital chamber, before turning posteriorly. It may reach even into the first abdominal segment.

The central vesicle usually has the form shown in figures 144 and

146 on Plate XVII. It consists of a very convex, often hemispherical, strongly chitinized body projecting into the genital chamber from the dorsal wall of the latter. Posteriorly there project from its base two arms (*a*) that diverge posteriorly, upward and outward in the roof of the genital chamber. From the anterior angles of the base two wider and shorter plates project anteriorly and outward (*b*). From the dorsal surface there project dorsally two large apodemes (*e*) into the space between the genital chamber and the tergum of the hypopygium. It is evident that the posterior arms of the central vesicle may be homologous with the anteriorly diverging roots of the penis in the lower genera. If the base of the penis in any of the latter forms were carried up the anterior wall of the genital chamber and then forward upon the dorsal wall, the arms originally projecting anteriorly would come to project posteriorly.

Between the posterior arms of the central vesicle, in the dorsal wall of the genital chamber, is a chitinous bar generally composed of two arms diverging posteriorly outward to the side walls of the genital chamber. This bar, on account of its usual shape and position, will be called the V-*shaped brace* (fig. 148). It sometimes does not have this typical form, however, and may be absent.

In some species of *Pachyrrhina* there are present rod-like appendages arising from the base of the guard of the penis that may be second gonapophyses. In *Tipula* such appendages are generally absent. When they are present they usually project posteriorly below the guard, and arise either from the sides, or the lower part, of its base. If these appendages are the homologues of the second gonapophyses in the lower genera, they have become greatly displaced.

Throughout the entire group there is a strong tendency toward the formation of three apical appendages. One of these is always situated dorsal to (which may mean either above or in front of) and on the outer side of the others. This is the one called by other authors the *upper appendage*. The second appendage is often concealed within the first and has been called the *middle appendage*. These two are almost invariably present and evidently are homologous with the apical appendages of the lower genera. The third is developed as a small lobe on the outer side of the base of the second. It is rudimentary in *Pachyrrhina*, *Ctenophora* and in many species of *Tipula*. In a large number of the species of *Tipula*, however, it is

well developed and often entirely separated from the second. It has been called the *lower appendage*. In the following descriptions the three will be referred to as the first, second and third appendages respectively, or as the upper, middle and lower, where there are three present; and in the figures they are lettered A, B and C respectively. The varying shapes of the three appendages will be shown in the special descriptions. The second has an almost constant character, however, that may be mentioned here. This is a thickening on the outer side of the anterior edge that appears as a partially detached and reflected plate, and nearly always ends in a free point above lying against the outer surface of the main body of the appendage. Typical examples are figures 83, B; 89, B; 121, B; and 159, B.

The tenth segment is a well developed tube, especially in *Tipula*, with the anus at the end. It arises from the dorsal part of the anterior wall of the genital chamber. It is generally contained within the latter, but in some cases projects prominently out of it (fig. 149, *a. t.*). In shape it is most often trihedral, one ridge being dorsal, and is always membranous, though in a few cases chitinous plates or bars appear in its walls.

Genus **PACHYRRHINA** Macq.

This genus is placed first in the series, because in the external structure of the hypopygium it most nearly resembles *Bittacomorpha* and *Ptychoptera*.

Pachyrrhina polymera Loew (Pl. XI, figs. 50, 60).

The hypopygium forms only a slight enlargement at the end of the abdomen. The eighth tergum is normal, the eighth sternum enlarged and prolonged beneath the ninth.

The tergum of the hypopygium is a simple convex plate, considerably wider than long, the posterior margin deeply cleft mesially, produced into a short outward curved point on each side. The sternum is a large plate with a double rounded posterior border, being deeply notched mesially. Continuous forward from the apex of the notch is a narrow, median, membranous space reaching almost to the anterior margin of the sclerite. At the anterior end of this membranous area there is movably attached a short cylindrical appendage projecting downward and posteriorly, and bifid at the tip. Each pleural plate extends the extire length of the hypopygium (fig. 60), but anteriorly it is fused below with the sternum.

There are two apical lobes on each side born by the distal end of the pleurum. The first or upper (fig. 50, A) is large and conspicuous, wide at the base, convex externally, tapering distally, and curving posteriorly, ventrally and inward (fig. 60). The second (fig. 50, B) is situated ventrad of the other and also mesad of it so that it is almost hidden by the upper in a lateral view (fig. 60). This appendage is shorter and thicker than the other. On the outer side of its base is a small lobe that bears two slender hook like processes (fig. 50, C).

The guard of the penis projects posteriorly and upward from the floor of the genital chamber. It is a simple elongate process deeply cleft lengthwise above. From its base there arises a pair of long curved hook like processes projecting upward at its sides.

The central vesicle is imbedded in a dense mass of muscle and connective tissue on the roof of the genital chamber The penis is very slender, in its terminal part so slender as to be almost thread-like.

Pachyrrhina lugens Loew (Pl. XI, figs. 51, 54).

The abdomen is club shaped, being evenly widened toward the posterior end. The eighth sternum is enlarged and prolonged beneath the hypopygium.

The tergum of the hypopygium is convex dorsally, notched mesially on the posterior margin, produced into a small point on each side of the notch. The sternum is very large; mesially it is deeply cleft by a linear notch from the posterior margin. The pleurum is well developed and is separated along its entire length from the tergum. The suture separating it from the sternum is distinct along the posterior two thirds of the segment, but vanishes in front of this (fig. 51).

The apical lobes (fig 54) are two in number on each side. The upper (A) is elongate, fusiform and flattened They project from the hypopygium like cerci from the tenth segment of other insects. The lower appendage (B) is wide, flattened, scale-like, hooked anteriorly, and is curved forward so as to lie beneath the ninth tergum. Two small lobes arise from the outer side of its base (C).

The guard of the penis is a simple, grooved, decurved process. From each side of its base there arises a small, flat, lobe with a terminal hook. These and also the similarly situated processes in *P. polymera* are probably the second gonapophyses.

Pachyrrhina erythrophagus.

The general shape of the abdomen and the hypopygium is very similar to that of the last species. The suture separating the pleurum from the sternum, however, is shorter and is curved upward at its anterior end for a very short distance. The upper apical appendage is wider than in the last species, the inner is more tapering.

Pachyrrhina incurva Loew (Pl. XI, figs. 52, 53).

The abdomen is club shaped as in the last two forms, the hypopygium not forming an abrupt enlargement.

On the sides of the hypopygium a strongly bent suture (fig. 53) partially separates the pleurum from the sternum. There are two apical appendages, the outer and upper one is elongate and slender, the lower is large, flat, with several irregular processes projecting upward.

In this species the penis is greatly prolonged, reaching forward into the first segment of the abdomen. The central vesicle lies very close to the floor of the genital chamber. From it the penis first curves upward (fig. 52) to the dorsal part of the abdomen, it then turns anteriorly and extends into the first abdominal segment. Here it makes a small loop ventrally, doubling upon itself and then again goes posteriorly close along the forward running arm. Posteriorly it descends past the anterior part of the central vesicle and finally turns posteriorly close upon the floor of the genital chamber. The posterior end is held in the guard of the penis. A delicate sheath, consisting of a tubular evagination from the genital chamber, contains the two arms of the loop of the penis.

The guard of the penis is a simple tapering process (fig. 52, *p. g.*) grooved above, arising from the floor of the genital chamber above the posterior edge of the sternum. Two free tapering arm-like processes extend downward and posteriorly from its base.

Pachyrrhina pedunculata Loew (Pl. XI, figs. 57, 58, 59).

Externally the abdomen is very simple, being evenly enlarged toward the posterior end.

The tergum of the abdomen is notched mesially in the middle line and on each side of this the margin is produced into a small point. The sternum is undivided below, but the median part is membranous. The pleurum is separated posteriorly from the sternum by a suture angularly bent upward at the anterior end (fig. 59).

There are two apical appendages on each side (fig. 58). The upper is a simple flat lobe tapering distally (A). The lower (B) lobe is wide and flat ending above in a narrow neck like process. Covering the outer anterior edge of the main lobe is a partially detached plate ending above in a free point. On the posterior distal angle is a high thin crest-like lobe, and on the outer side of the base a small elongate lobe (C).

The penis extends forward to the anterior part of the sixth segment, making an ordinary wide bend. The central vesicle (fig, 57, *c. v.*) faces anteriorly, *i. e.*, the surface usually directed downward is turned forward. The penis, hence, first goes dorsally and posteriorly making a wide loop by curving downward to the ventral part of the abdomen in the sixth segment, and then going posteriorly to the guard of the penis on the floor of the genital chamber. The latter (fig. 57, *p. g.*) consists of a straight tapering rod grooved above. A thick tapering process projects posteriorly from its base; from each side of the base there arises a slender sickle shaped process.

Pachyrrhina ferruginea Fab. (Pl. XI, figs. 55, 56).

The hypopygium is very simple in its structure. The tergum is deeply notched in the median line on the posterior border. The sternum is also deeply notched mesially. The pleura are separated from the sternum on each side by a suture running forward three-fourths the length of the hypopygium and then ending in an upward bend.

Of the two apical appendages the upper is thin, wide basally and tapering distally, and is curved inward. The lower one is wider and shorter and ends in a point directed upward and forward. On its outer anterior edge is an elevated ridge ending above in a free point.

The penis extends forward to the anterior end of the fourth segment. The guard of the penis is simply a trough-shaped structure projecting backward from its origin on the floor of the genital chamber just in front of the notch of the sternum. The base of the guard is expanded laterally, and from each expansion there projects posteriorly a long bifid appendage (fig. 55.) The lower arm on each side is the larger. It is tapering, convex outwardly along the basal half, inwardly along the distal half, and terminates in a small knob. The dorsal arm is shorter, slenderer and more tapering than the lower. From the common base of each pair a long arm-like pro-

cess extends forward buried in the muscle and connective tissue of the floor of the genital chamber.

Genus **TIPULA** Linn.

According to the structure of the hypopygium, Westhoff, whose paper on the hypopygium of *Tipula* was discussed in the introduction to this paper, divides this genus into seven groups. These groups, however, are established on combinations of so many characters, and on characters whose morphological value is small on account of their variability, that they can scarcely be regarded as natural divisions or as having any phylogenetic significance.

The most fundamental modification that takes place in the hypopygium of the entire family is the variation in the position of the pleura. But Westhoff, in his study of *Tipula* alone, almost entirely overlooked these plates. However, if we arrange the species of *Tipula* according to the structure of the pleural plates, we shall have three groups that very logically follow in succession after the genus *Pachyrrhina*. These three groups will be characterized as follows:—I, the pleural region, on the side of the hypopygium, is separated from the sternum by a latero-ventral suture ending in a short outward or upward curve near the middle of the segment; II, the pleurum is entirely separated from the lateral part of the sternum, and consists of a small generally triangular plate set into the posterior lateral margin of the segment; III, the pleurum is entirely fused with the lateral part of the sternum. For convenience we will call the suture below the pleural region in Group I the *pleural suture*. In Group II the plates called pleural plates or pleura can evidently not be equivalents of the entire pleurum in *Pachyrrhina* and in the genera below it.

Group I.

Pleural sutures present.

The presence of pleural sutures, almost identical with those of *Pachyrrhina*, very clearly places this gronp at the bottom of the Tipula series. The transition from *Pachyrrhina* is perfect. The following eight species examined belong here.

Tipula fumosa Doane (Pl. XII, figs. 64, 65).

The eighth segment is shorter than in the last species. Its tergum is mostly concealed beneath the seventh (fig. 64), although the sternum is produced beneath the hypopygium.

The hypopygium is cup shaped, the rim of the genital chamber faces posteriorly and upward. The tergum bears a small, median, quadrate lobe on the posterior margin with the angles produced outward as two small horn-like processes. The sternum is continuous across the median line. On each ventro lateral aspect a suture runs forward from the posterior margin half way to the anterior. This is evidently the same suture that in *Pachyrrhina* marks the ventral margin of the pleurum, and is the one we will call in *Tipula* the *pleural suture*. The plate partially separated off above it always carries the apical appendages.

There are two apical appendages on each side. The first (figs. 64 and 65, A) is long, slender and curved. The second (B) is large, wide and flat. The distal half is curved forward. The basal half is quadrate and bears a tapering lobe on each distal angle.

The central vesicle and penis are of ordinary form. The latter curves through the eighth segment. The guard is a simple stylet-like structure deeply grooved above. Two small strap like processes project downward from its base at the posterior edge of the ninth sternum.

Tipula brevicollis (Pl. XII, fig. 69).

The pleural suture is present and bends slightly upward at its anterior end. The sternum is widely continuous across the median line, but is deeply emarginate posteriorly.

Tipula tricolor Fab. (Pl. XV, figs. 119, 121).

The eighth segment is normal and does not project specially beneath the hypopygium.

The hypopygium itself has a rather simple appearance and forms scarcely an enlargement of the abdomen (fig. 119). The tergum is small, and its posterior margin is graduated. The lateral parts of the sternum are attingent below, but are separated by a membranous suture. The only connection is a semi circular chitinous bar continuous from the anterior margin of one side to that of the other. A rather long longitudinal pleural suture on each side marks the lower edge of the pleural region, but otherwise the pleurum is not separated from the lateral part of the sternum. The part of the sternum below this suture forms a partially free lobe.

The apical appendages are very large and of regular outline forming an even outline posteriorly (fig. 119). The first appendage (fig. 121, A) is a very large, flattened, irregularly quadrate plate almost

entirely covering externally the other two. The second and third are united by their bases. The former (B) is triangular, its anterior angle produced into a rounded prolongation, the proximal part of its anterior border reflected as a free lobe on the outer side. The third appendage (C) covers the outer posterior part of the second. It consists of three partially separated lobes, one of which sends a long curved arm forward.

The central vesicle is of ordinary form. The V-shaped bar between its position arms is very large and apparently serves as a brace to keep the walls of the genital chamber apart. The guard of the penis is a simple stylet-like affair with a groove along the upper side.

Tipula cognata Doane (Pl. XVIII, figs. 154, 155, 157).

The eighth sternum is not specially modified, being neither armed nor produced beneath the ninth.

The tergum of the hypopygium is separated from the sternum by only an indistinct groove. The posterior margin of the tergum is produced into two slender, finger-like processes projecting caudally. The plates of the sternum are separated by a wide membranous area extending the entire length of the ventral aspect back of a narrow anterior connecting bar of chitin (fig. 155). The posterior edge of the sternum is deeply and widely emarginate. The median membrane expands posteriorly so as to form most of the posterior margin, and its free edge presents a chitinous thickening. From near each outer angle of the emargination a suture runs forward but ends back of the middle of the segment. The anterior end is very slightly curved outward. The two are the pleural sutures (figs. 154 and 155, *p. s.*).

There are only two apical appendages on each side (fig. 157). The first (A) is a simple, wide, somewhat fleshy plate, bluntly pointed distally. The other (B) is large and has the curious shape shown in figure 157. It consists of an upper part having the form of a flat, blunt hook with the tip curved forward, and of a similar but larger lower part extending downward and curving forward.

The central vesicle and penis have ordinary forms. The latter makes but a small curve forward. The guard of the penis is simple and stylet like.

Tipula caloptera Loew (Pl. XVI, figs. 128, 129, 130, 131).

The abdomen is widest through the seventh and eighth segments

(fig. 128). The hypopygium is relatively small, and projects upward and posteriorly from the eighth segment. The sternum of the latter is not specially produced beneath it.

The tergum and sternum of the hypopygium are not separate, and the pleural plates are not distinct from the sternum. Pleural sutures are present. The tergal aspect (fig. 130) is quadrate, roundly concave anteriorly, produced into three processes posteriorly, one of which is wide and median, the other two hook-like and situated nearer the lateral margin. The sternal parts (fig. 129) have essentially the same structure as in *Tipula bella*. The anterior margin is strongly convex. Separated from it by a narrow chitinous band is a large membranous area, and back of this is the posterior margin forming a deep re entrant angle. The pleural sutures (fig. 129, *p. s.*) running forward and then turning outward a short distance, set off two prominent mesal lobes of the sternum having free rounded apices. The apical appendages are three in number. The first (fig. 128, A) is triangular and attached by one of the angles. The other two consist of irregular plates mostly fused with one another.

The central vesicle is of ordinary shape. The posterior arms are somewhat long, and the apodemes relatively small. The V shaped bar between the posterior arms of the vesicle is extremely large; it reaches on each side to the lateral walls of the genital chamber and embraces the base of the anal tube between its arms.

The guard of the penis arises from the floor of the genital chamber, above the anterior end of the sternal notch. It has the ordinary slender, tapering form, with a longitudinal groove above (fig. 131, *p. g.*). Basally it is triangularly enlarged. From this enlargement two short horn like roots project anteriorly (*a*). From the sides two large, free, elongate, flat, twisted arms proceeds posteriorly (*b*). Each is widest near middle, curved inward distally, and ends in a small, blunt, hook-like point. The tips are visible below, from the outside of the hypopygium, projecting beyond the ends of the ventral sternal lobes (fig. 129, *b*).

Tipula tephrocephala Loew (Pl. XV, figs. 118, 120, 122).

The eighth segment is not specially modified. The tergum is relatively large and the sternum is no larger than the seventh (fig. 118).

The tergum of the hypopygium (fig. 120) has a simple quadrate form with two slender, divergent arms projecting posteriorly from the posterior margin. The lateral sternal plates are separated below

by a high, crest-like fold of membrane (fig. 118, *a*), except anteriorly, where they are united by a transverse, arched bar of chitin. A horizontal pleural suture running a short distance forward on the side of the hypopygium (fig. 119, *p. s.*) is present, the part above it carrying the apical appendages.

Of the three apical appendages (fig. 122) on each side, the first (A) is the largest. It is flattened and distally is curved posteriorly, and the two form a pair of conspicuous lobes at the apex of the hypopygium (fig. 118). The second (fig. 122, B) has the form of a flat hook with a very wide base and the point turned forward. The third lobe (C) arises from the outer side of the base of the second and overlaps this lobe externally. It has the complicated form shown in the figure.

The penis curves forward to the anterior part of the seventh abdominal segment. The guard is a simple structure composed of two thin, closely appressed blades, set on edge and united by their ventral edges.

Tipula bisetosa Doane (Pl. XIV, figs. 104, 106, 107).

The eighth sternum projects beneath the hypopygium. The posterior margin is notched. The lateral angles of the emargination are provided each with a long slender hook, from the apex of the notch there arises a wide brush of hairs.

The tergum of the hypopygium is distinct from the lateral parts of the sternum, and is simply emarginate posteriorly. The lateral parts of the sternum are separated by a rather wide membranous area below. This membrane ends posteriorly in a large fold (fig. 106, *a*). The pleura are not separated from the sternal plates. The pleural region on each side is limited below by a groove running forward a short distance from the posterior rim of the segment (fig. 106), and each has its margin produced into a small tapering process.

There are three apical appendages (fig. 104). The second (B) and third (C) are united basally. The first (A) arises from a slender peduncle lateral of the base of the other two. The first is wide, flat and spatulate. The second is elongate dorso-ventrally, and arises from a short thick stalk at right angles to the rest of it. The third is a triangle with the apex distal.

The guard of the penis (fig. 107, *p. g.*) is a short, fusiform structure composed of two blade-like, appressed plates set on edge and having their ventral edges united by membrane. From the sides of

the base two long, slender, slightly curved, tapering arms (*a*) project backward below the guard. Below these is a thicker, median, tapering arm bent downward at its middle, and then forward in a sharp hook (*b*). The central vesicle, penis, and anal tube are of ordinary structure.

Tipula bella Loew (Pl. XVI, figs. 123, 124, 125, 126, 127).

The hypopygium has the simple form shown in figure 123. There is no suture between tergum and sternum and there are no pleural plates separate from the sternum. Pleural sutures, however, are present as shown in figure 124. The tergal part is produced caudally beyond the apical rim of the lateral and ventral parts as a densely chitinous, triangular plate terminating in a decurved hook-like tooth.

Figure 124 shows a ventral view of the hypopygium with the apical appendages removed. The sternal margin is thus seen to be deeply notched by a deep emargination, which is linearly prolonged anteriorly past the middle of the segment. Here the notch ends against a large, pentagonal, membranous area which occupies nearly all of the ventral surface of the segment in front of the notch, leaving only a narrow arched bar of chitin forming the anterior sternal margin. This is a very general structure of the sternum throughout the genus. At about the middle of each lateral margin of the wide part of the sternal notch, a wide, membranous suture runs inward and then forward about two-thirds the distance to the anterior membranous area. Here it abruptly curves outward a short distance and ends. The two are the pleural sutures (fig. 124, *p. s.*). The tip of the sternal lobe formed on each side between the suture and the median notch rapidly tapers and turns mesially as a free point.

The apical appendages form one large irregularly lobed structure on each side. Figure 123 shows them in their natural position attached to the hypopygium. Figure 127 shows them somewhat flattened out in a lateral view. The first (A) is a large bi-lobed triangular, fleshy plate attached by an angle to the base of the others. The second and third (B and C) form together a tri lobed mass lying within and posterior to the first.

The central vesicle has its ordinary ventral surface directed anteriorly. The posterior arms, hence, extend downward and the apodemes posteriorly. The penis starts forward from the vesicle, but it

almost immediately makes a sharp bend dorsally and anteriorly (fig. 125).

The guard of the penis (fig. 126, *p. g.*) arises from the floor of the genital chamber over the ventral membranous area. It is a long, slender, tapering, stylet-like structure, grooved lengthwise above, swollen toward the base, arising by a contracted neck from a chitinous support on the floor of the genital chamber. From this support there projects posteriorly beneath the guard two weakly chitinous clavate appendages.

The anal tube has two delicate, band-like arms of chitin extending down upon its upper surface from the free edges of the tergum.

Group II.

Pleural plates present.

This group includes the majority of the species of *Tipula*. It is conceivable that the pleural plates have been formed by the secondary growth of the upturned anterior ends of the pleural sutures of Group I, in a dorsal direction, till they cut off back of them on each side the posterior end of the original pleurum. These plates always carry the apical appendages. If they have been formed in the manner just suggested, then Group II logically follows Group I.

Tipula augustipennis Loew (Pl. XVII, figs. 139 to 149).

The posterior part of the abdomen forms a club-shaped enlargement (fig. 139), and the hypopygium is directed upward and posteriorly.

The tergum of the hypopygium (figs. 141 and 142, IX, *t.*) is a wide plate having the anterior margin straight and the posterior deeply notched. The margins of the notch are formed by two partially detached, elongate lobes. The sternum consists of two large plates (IX, *s.*) covering most of the sides of the segment, but separated below by a rather wide membranous space (figs. 142, 147). Anteriorly the two are united in front of the membrane by a very narrow bar of chitin (fig. 147). The posterior margin of the membrane is deeply notched. From the bottom of the notch there projects posteriorly a slender, weak, tapering appendage (fig. 147 *a*). To each corner of it there is attached a small chitinous lobe (fig. 147, *b*). The pleura are well developed and are entirely separated from the lateral parts of the sternum (figs. 141, 142, 147, *pl.*).

Each is a large plate, somewhat irregularly triangular in shape, with a large posterior prolongation.

There are three apical appendages on each side, but the second and third are so united basally that they form one large bilobed structure. The first (fig. 142, A and fig. 143) is comparatively very small and is a simple, fleshy, cylindrical appendage. The second (figs. 140, 141, 142, B) is a large plate having in side view the form shown in figure 140. It is extended in transverse and perpendicular planes from the inner face of the pleurum, and the two form a double door like covering over the genital chamber. The third or lower most appendage appears like a large ventral lobe of the second (fig. 140). In side view it appears somewhat hood like being curled outward from above and then downward.

The central vesicle has the typical hemispherical form (figs. 144 and 146). The penis does not extend forward beyond the middle of the eighth segment (fig. 149).

The guard of the penis is a simple, thick structure (fig. 145), grooved above, widened basally and subterminally, ending in a short, thick, tapering prolongation.

Tipula trivitta Doane (Pl. XVIII, figs. 150, 151, 152, 153).

The general appearance of the apical end of the abdomen and of the hypopygium is similar to that of *Tipula angustipennis*. The posterior margin of both the tergum and sternum is notched. From the apex of the notch of the latter there extends forward a narrow membranous area. The pleura are distinct from the sternum, and each is roughly triangular in shape.

There are only two distinct apical appendages on each side (fig. 153). The first (A) has the common elongate, clavate form, and is articulated to the base of the second. The second (B) is a large, flattened, somewhat elongate plate, with the distal end tapering and turned forward, and the anterior margin reflexed outwardly as an elongate lobe, with a free distal end and posterior edge. From the posterior part of the base of the second there projects caudally a small triangular lobe (C), this may be the third appendage.

The central vesicle is flat; seen in side view (fig. 150, *c. v.*) it is scarcely convex below. The posterior arms are rather long and slender, and expand distally. From each lateral anterior angle a semi circular flap-like plate extends outward. Between the posterior arms is a bar of chitin that corresponds with the ordinary V-

shaped brace, but in this species it is bent into five sides of a hexagon (fig. 152). The open side is posterior. All of the sides are angulated in a dorso-ventral direction, so that the figure is not very regular in side view (fig. 150, *br.*). The penis is short and thick. It extends in a curve ventrally and posteriorly from the central vesicle (fig. 150, *p.*). Subterminally it is thickened and soft. It ends in a tapering point. The guard of the penis (fig. 151) consists of two high vertical plates set close together and united by membrane along their lower edges. Each is partially divided lengthwise into an upper and a lower half. The former projects posteriorly with a free blunt point (fig. 151), while the latter has a decurved terminal part ending in a small hook.

The tenth segment consists of a large, conspicuous, trihedral, anal tube projecting posteriorly between the apical appendages.

Tipula incisa Doane (Pl. XVI, fig. 136).

The eighth sternum is large and is produced beneath the hypopygium. Its posterior border is provided with a wide brush of hairs.

The hypopygium has the typical form, consisting of tergum, pleura and sternal plates, separated below by membrane, except anteriorly, where they are united by a chitinous bar.

The apical appendages (fig. 136) are three in number. The first (A) is a slender, delicate, sinuous rod. The second (B) is large, quadrate, and born on a thick peduncle. The third (C) is attached basally to the second. It is a wide plate of about uniform width.

Tipula truncorum Meigen (Pl. XVI, figs. 132, 134).

The eighth sternum is somewhat enlarged and prolonged beneath the hypopygium. Its posterior margin bears a wide median brush of hairs covering the membranous area of the ninth sternum.

The hypopygium is somewhat elongate (fig. 132). The tergum is notched mesially, produced into a small point on each side. The sternum has the typical form, being composed of two lateral plates, separated by a membranous area below, except in front, where they are connected by a narrow chitinous bar. The posterior margin is notched. At each side of the notch is attached a small transverse lobe. The pleura are small, but are entirely separate from the sternum (fig. 132).

The apical appendages (fig. 134) are three in number. The first

is a slender club-shaped lobe (A). The second (B) has the typical form of a wide plate ending distally in a point turned forward, and having all but the terminal part of the anterior margin reflected externally upon itself as a narrow lobe with free edges. The third (C) is smaller, triangular, and arises from the outer side of the base of the second.

Tipula acuta Doane (Pl. XV, figs. 112, 113, 115, 116, 117).

The eighth sternum is enlarged and projects prominently beneath the hypopygium. Its posterior margin is concave and bears mesially two wide, crossed brushes of hairs (fig. 113). On each side there is articulated to it a wide appendicular lobe ending in three large blunt processes.

The hypopygium is of ordinary form, and consists of a distinct tergum, pleura and sternal plates. The tergum (fig. 117) is a wide plate with both anterior and posterior margins concave. On the posterior margin are two median triangular points. From the posterior angles of the sternum there project downward two slender arm like appendages (fig. 115).

The three apical appendages are simple. The first is flattened and clavate, the second largest and triangular, the third is small and attached to the base of the second.

The guard of the penis (fig. 116) is flattened and somewhat decurved. Just beyond the base it contracts to a narrow stalk, beyond which it rapidly expands into a wide triangular plate, having the distal edge produced into a median and two lateral triangular lobes. A deep groove traverses the entire length above.

Tipula æqualis Doane (Pl. XIII, figs. 78, 79).

The eighth sternum is rather large and is deeply emarginate on its posterior border. From the apex of the notch there diverge downward and posteriorly two long slender brushes of hairs. From each lateral angle of the notch there arises a short conical lobe attached by its apex (fig. 78, *a*). Its distal flat end is triangular and concave, and the outer angle is produced into a large, strong, inwardly curved hook. In this character this species closely resembles *T. inermis*.

The tergum of the hypopygium is almost divided by a deep median notch. The sternum has the ordinary form, being deeply cleft mesially, with the two lateral plates united by a narrow bridge of

chitin anteriorly. Two large lobes (fig. 78, *b*) arise from the membranous areas ventrad of the pleural plates and hang downward. These are not apical appendages, for they do not arise from the pleura. The pleura are well developed as distinct plates set into the posterior upper angles of the sternum (fig. 78).

There are only two apical appendages on each side. The first is a simple clavate lobe rising vertically from the rim of the genital chamber (fig. 79, A). The second (B) is wide, flat, densely chitinous distally, with the tapering end directed anteriorly. Covering the basal three fourths of the anterior edge is the characteristic flat elevation with free edges.

The guard of the penis is a narrow shaft that expands distally into a wide, flat, flaring, triangular plate. The latter ends in one median and two lateral points, each bearing a decurved terminal hook.

Tipula cineracea Coq. (Pl. XIII, figs. 80, 81, 82, 83).

The eighth segment is not specially enlarged. The seventh, eighth and ninth segments form a large knob-shaped swelling at the end of the abdomen. The hypopygium is directed posteriorly and upward at an angle of about 45° with the axis of the abdomen.

The tergum of the hypopygium is a simple transverse plate, emarginate posteriorly, separated on each side by a distinct suture from the sternum. The lateral sternal plates are separated below by a narrow linear membranous area. Their anterior angles are connected by a narrow bridge of chitin with a slender, median, tapering tongue of chitin running caudally in the membranous area back of it. Each pleural lobe is large, rhomboidal and set deeply into a notch on the side of the sternum.

There are three apical lobes on each side, but only the first two are well developed (fig. 83). The first (A) has the ordinary clavate form. The second (B) is larger and plate-like. It expands somewhat beyond the middle, and distally ends in a blunt point turned forward. Most of its anterior edge is covered by a narrow lobe like elevation. The third appendage (C) is a very small, simple, clavate lobe arising from the outer side of the base of the second.

The central vesicle is rather flat. The penis is also flat and strap like. It is short and bends almost immediately downward from the central vesicle. The guard of the penis consists of two longitudinal

plates set on edge, with the posterior end of each turned downward like a pistol grip (fig. 82, lateral view). A transverse V-shaped plate, with the apex greatly prolonged and trough-like, connects the two lateral plates and forms a wide groove lodging the penis (fig. 81, dorsal view).

Tipula retusa Doane (Pl. XIII, figs. 84, 85, 86, 87, 88).

The eighth sternum is extraordinarily large and very convex below. Its posterior margin is horizontal. The eighth tergum, on the other hand, is small and mostly concealed beneath the seventh tergum (fig. 84). The end of the eighth segment thus forms a cup-shaped cavity directed upward, into which is set the base of the hypopygium. The sternum bears posteriorly on each side a wide brush of hairs directed ventrally.

The hypopygium projects almost vertically from the eighth segment. It has in general the form of a frustum of a cone. There are well developed triangular pleural plates present. The halves of the sternum are fused below along their entire length. Posteriorly the sternal margin is emarginate. An elongate, club-shaped lobe (fig. 84, *a*) arises on each side from the margin of the sternum, lateral of the median notch, and projects posteriorly. The tergum is almost divided into two plates (fig. 86) by a deep notch on the posterior margin, and a still deeper one on the anterior. The two leave only a very narrow connecting bridge somewhat back of the centre.

There are three apical appendages on each side (fig. 85). The first (A) is the smallest, being slender, compressed and clavate. The second (B) is the largest. It is expanded distally and ends in a flat point directed forward. Its anterior edge bears the ordinary elongate elevation, ending with a free lobe above. The third (C) is entirely separated from the second. It is widest basally and tapers distally to a narrow elongate process abruptly bent posteriorly.

The central vesicle (fig. 88, *c. v.*) has the anterior arms rather slender, but the posterior arms and the apodemes are relatively large. The penis (*p.*) first goes downward and then turns forward to about the seventh segment. It then again goes posteriorly to below the central vesicle where it turns dorsally along the vertical floor of the genital chamber. The tip is curved anteriorly. The guard of the penis (fig. 87) consists of two high and relatively short plates united by their lower edges, and inclosing, thus, between them a deep trough-like space. From the lower posterior angle of each a long,

slender, blade like plate extends caudally, the two having their flat surfaces apposed and vertical. Below their bases there projects ventrally and posteriorly, from the ventral surface of the guard, a transverse, pointed, chitinous process.

Tipula inermis Doane (Pl, XIII, figs. 89, 90, 91, 92, 93).

The eighth sternum is large, prolonged posteriorly and armed at the posterior end. The posterior border of the sternum is deeply emarginate (fig. 92). At each side of the emargination is born a large, three-sided, conical lobe (*a*) attached by its apex, similar to that of *Tipula æqualis*. The flat bases of these lobes are turned upward and inward. The dorsal angles of the bases are connected by an arched bar of chitin lying in a membranous fold above. At the apex of the notch of the sternum is a wide, rounded, plate-like lobe (*b*) projecting posteriorly and ventrally. On each side of it there projects posteriorly a long arm-like process (*c*). From each inner ventral angle of the conical lobes (*a*) a pencil of hairs projects inward and posteriorly.

The hypopygium is somewhat flattened upon the end of the abdomen (fig. 91). The sternum is divided by a V-shaped notch almost to its anterior margin. In front of the apex of the emargination is a membranous area, and in front of this is a chitinous bar connecting the lateral chitinous parts. There is a submarginal suture along each side of the notch, and the two separate off a V-shaped marginal lobe. Each posterior end of the latter forms a small knob supporting a bunch of hairs. Lateral of this there is a hook shaped appendage on each side arising from the sternal margin (fig. 91, *d*). There is a well developed triangular plate on each side, separated by an angular suture from the lateral part of the sternum.

There are three apical lobes, all of them arising from a common base (fig. 89). The first (A) is small, flat and spatulate. It arises from the anterior part of the base of the second. The first very commonly arises close to the base of the second, but it is seldom attached almost to the side of it as in this species. The second appendage (B) is large and flat. Distally it is expanded and produced into a blunt point posteriorly and a sharper one anteriorly. The anterior margin below the lobe is reflexed posteriorly over the outer side. The third appendage (C) is a short slender arm arising from the posterior edge of the base of the second.

The penis and central vesicle are ordinary. The guard of the penis is an elongate bar widened distally into a triangular plate, ending in a median point and two longer club shaped lateral arms. A median, dorsal groove runs along its entire length (fig. 93).

The anal tube is exceptionally large (fig. 90), being wide basally and very long, so that it projects far out of the genital chamber (fig. 91, *a. t.*).

Tipula bicornis (Pl. XIV. figs. 94, 95, 96, 97, 98, 99, 100, 101).

The eighth sternum is greatly elongated and produced posteriorly. The sides are convergent, but the end is truncate and bears a flat brush of long hairs.

The tergum of the hypopygium (fig. 101) is very long, widest at the base, slightly tapering distally. The posterior margin is notched mesially and on each side is produced into a tapering horn-like process, projecting outward and posteriorly. On account of the great length of the tergum the hypopygium is much longer above than it is below. Between the tergum and the pleurum on each side (fig. 94) is a wide triangular membranous area. From a point somewhat beyond the middle of each lateral margin of the tergum a chitinous band extends downward and posteriorly through the membrane just described and unites with the side of a small trapezoidal plate on the ventral wall of the anal tube (fig. 100).

The pleura are triangular plates distinct from the sternum. Each has a wide convex anterior edge. The other two edges are concave. From the upper angle there projects posteriorly and upwardly a sharp tapering process (fig. 94). This is simply a prolongation of the pleurum itself.

There are three apical appendages on each side (fig. 98). The first (A) is short, cylindrical and very slender. The second (B) is nearly twice as long as the first. It is an elongate stalk-like structure, with an enlarged, distally rounded, cap-like head. The third (C) arises from the posterior edge of the base of the second. It consists of a narrow basal peduncle, a triangular, flattened plate beyond this, and of a slender distal arm with a terminal enlargement.

Just below each pleurum there projects posteriorly from the sternum a small flattened truncated lobe (fig. 94). Each of these processes bears on its inner side a small appendage (fig. 96), which carries a bunch of long, spirally twisted hairs on a knob near its inner end.

The central vesicle (fig. 97) is hemispherical. Its posterior arms are long and slender, the anterior lateral lobes are large, wide, rounded plates. The penis is extremely slender, almost hair-like, and runs forward to the third abdominal segment before turning posteriorly.

The guard of the penis (fig. 95, *p. g.*) is an elongate pyriform structure with a median groove along the dorsal side. It is supported on a rather complicated framework of chitinous bars. A flat chitinous tongue like process, pointed distally, arises from the ventral side of the guard and projects posteriorly below it. The supporting framework alone is shown in figure 99; *a* is the ventral tongue of the guard with the latter removed from its proximal end. On each side there is a long plate bent into a right angle (*b*). One arm of each lies along the side of the guard, the other projects outward and downward from the distal end of the first. From the angle a tapering plate (*c*) runs posteriorly, inward and downward, and unites with the ventral tongue of the guard. The latter is connected in a similar manner with the middle of the longitudinal arm by a tapering bar (*d*). The guard itself is, thus, supported only by its ventral tongue, this being attached to the plates on each side by the two pairs of transverse connectives.

Tipula lamellata Doane (Pl. XII, figs. 73, 76, 77).

The eighth sternum is prolonged posteriorly beneath the hypopygium and bears at its truncated end two brushes of long hairs (fig. 77).

The tergum of the hypopygium has almost the shape of the capital letter A with the apex cut off (fig. 73). It consists of two narrow plates diverging widely posteriorly and connected near their middle by a transverse crescentic bar of chitin. The concave posterior border of this bar forms the posterior margin of the tergum. The area in front of it is membranous. The pleural plates are small. Each (fig. 77, *pl.*) has the appearance of being an appendage on the posterior rim of the sternum. It consists of a short wide basal part and a free tapering but blunt process projecting posteriorly. To the inner side of its base is attached the apical appendage.

There is only one apical appendage on each side and this is the second (fig. 76). It is a wide, flat plate arising from a narrow base but rapidly expanding distally. It bears a sharp-pointed projection

on the middle of its distal edge, and another longer and slenderer one on the anterior angle. The latter projection is covered basally on its outer side by a lateral lobe. This is the characteristic feature of the second appendage.

The guard of the penis is triangular in lateral view. The lateral parts are transversely continuous into each other below. There is thus formed between them a wide space in which the end of the penis lies normally. In the specimen from which figure 77 was drawn the end of the penis (*p.*) was projecting from the genital chamber. The posterior dorsal angles of the guard are swollen into large, pale, tumid, semi chitinous lobes. The guard arises just above the posterior edge of the sternum, which is deeply notched. The sides of the notch bear two pad like, chitinous lobes. In front of these there is a narrow membranous space extending forward to the anterior rim of the sternum, which consists of a slender, arched bar of chitin.

Tipula unicincta Doane (Pl. XV, figs. 109, 110, 111, 114).

The posterior segments of the abdomen form a thick club shaped enlargement. The eighth segment is the widest, and its posterior rim is horizontal. The exposed part of the ninth is hemispherical and sits upon the eighth like a ball in a socket. The eighth tergum is small, but the sternum is very large and projects posteriorly and upward behind the hypopygium (fig. 109). It ends in a small transverse lobe bearing a fringe of long hairs. There is a rather wide depressed area between this lobe and the posterior (*i. e.* ventral) face of the hypopygium. From the floor of this depression there project two lateral, conical elevations (fig. 109, *a*) each bearing a long, slender, curved, blade-like appendage (fig. 109, *b*), the two crossing each other mesially (fig. 114).

The plates of the hypopygium have ordinary forms. The posterior margin of the tergum is deeply and narrowly cleft. The part on each side is produced posteriorly as a large tapering process. The sternum consists of two large lateral plates connected only by a narrow anterior median bridge of chitin below. Back of this bridge is a wide membranous area whose posterior margin hangs downward as a free fold (fig. 109, *c*). The pleurum is distinct from the sternum on each side. It is triangular, with the distal apex produced into a blunt, tapering point.

There are three apical appendages (fig. 110). The first (A) is flat and expanded distally, contracted into a slender peduncle basally. The middle lobe (B) is a wide triangle with a thick basal stalk. On the outer side of the basal two thirds of its anterior edge is a reflected elevation of the margin. The third lobe (C) arises from the posterior edge of the base of the second. It is short, wide and triangular, but is attached by one side. It bears a fringe of very long hairs.

The central vesicle and penis are of ordinary forms. The guard of the penis (fig. 111, *p. g.*) is a simple, slightly decurved, tapering, stylet like process arising from the floor of the genital chamber just above the posterior end of the median membranous area of the sternum. Its upper surface bears a deep longitudinal groove. Just below its base there arise two large, heavy, chitinous appendages (fig. 111, *a*) projecting posteriorly and dorsally (upward and forward in actual position). A little beyond its middle each is abruptly thickened by a lobe like ventral swelling. Beyond this it tapers to a slender, slightly decurved point. Below the bases of this pair of appendages there arises a single median appendage. This one arises from two converging basal rami, is thick basally, tapering and decurved distally, and ends in a small, transverse, triangular, arrow-head-like plate. The structure of the guard and the appendages below it is, thus, very similar to that of *Tipula bisetosa* (cf. figs. 107 and 111). The apical appendages are also very similar (cf. figs. 104 and 110). The general external shape of the hypopygium, however, is different, and in *T. bisetosa* the pleural plates are not separated from the sternum (cf. figs. 106 and 109).

Tipula streptocera Doane (Pl. XIV, figs. 102, 103, 105).

The eight sternum is very large, being high on the sides and greatly prolonged posteriorly beneath the hypopygium. The posterior margin bears two short, thick, articulated, clavate lobes normally directed upward (fig. 102, *a*). The eighth tergum is a very small, semi circular plate covering the base of the dorsal surface of the hypopygium.

The hypopygium itself is rather small and is irregularly globular. Its walls consist principally of two large lateral plates, which are the lateral parts of the sternum with, perhaps, the tergum united. The two plates are separated along the mid-dorsal line by a narrow

linear membranous area. The dorsal part of each plate is distinguished from the rest by an oblique suture that cuts off on each side a triangular marginal plate having the apex forward. The two dorsal plates thus formed may represent the tergum divided by a median line of membrane. Each plate makes a sort of step posteriorly by turning downward and then posteriorly again. The pleura are entirely separated from the lateral sternal plates. Each is somewhat reniform in shape, with the convex side posterior and prolonged into a long, sinuous, tapering arm (fig. 103). This is similar to the much smaller process on the pleurum of *Tipula lamellata* and of *T. unicincta*.

The apical appendages have an unusual shape (fig. 105). There is on each one large triangular lobe (B) attached by an angle which forms a thick peduncle. From its position and general shape this lobe would appear to be the middle appendage of the ordinary three. Arising from the outer side of its base are two much smaller lobes (A and C). Each is flattened and expanded distally, and the two have a common base. One is anterior and turns forward, the other posterior and turns backward. They may be the first and third appendages.

The central vesicle, penis and guard have ordinary forms. The V-shaped bar between the posterior arms and the central vesicle has the tips of its arms embracing the base of the anal tube.

Tipula spectabilis Doane (Pl. XVIII, figs. 156, 158, 159, 160, 161).

This is a large species, with a specially large hypopygium. The latter stands almost vertically upon the eighth segment (fig. 160). The eighth sternum is large and prolonged so far posteriorly that it projects for some distance back of the vertical sternum of the hypopygium. The posterior end of the eighth sternum is truncate and deeply notched. The part of the margin on each side of the notch forms a large, inward-turned flap bearing a large brush of long hairs.

The tergum of the hypopygium consists of two plates entirely separated by membrane along the mid dorsal line (fig. 156). The anterior edge is widely emarginate. Posteriorly each plate of the tergum is produced into a lateral and a more median point, while from between the two plates there projects caudally a short tapering process which is grooved along its dorsal side.

The sternum consists of two lateral plates as in other species. But here they are united below by a posterior bridge of chitin as

well as by an anterior one (fig. 161). The posterior margin is notched and each side of the notch bears a transversely elongate lobe.

The pleura are separate from the sternum. Each consists basally of an ordinary triangular plate, but the posterior margin is prolonged into a long curved arm ending in a large spatulate expansion (fig. 160). In this character the species strongly resembles *Tipula streptocera*.

There is but one terminal appendage on each side, but it probably is composed of both the second and the third appendages (fig. 159). It consists of an anterior and a posterior part. The former (B) is a wide plate with a blunt anterior tip and reflexed anterior margin, so that there can be no doubt that it is the ordinary second appendage. The latter is a triangular lobe (C) on the posterior edge of the base of the other, and is partially divided into several finger-like lobes.

The guard of the penis (fig. 158) is a simple, decurved, tapering process with a wide groove above. In this groove are two elongate lamellæ inclosing the penis between them. Their posterior tips project from the groove, as a separate process, above the tip of the main part of the guard. The central vesicle and penis have ordinary forms.

Tipula dorsolineata Doane (Pl. XII, figs 72, 74, 75).

The terminal part of the abdomen is bent upward, but the hypopygium does not form an enlargement of it. The eighth segment is wider than the ninth, and both tergum and sternum are large. The tergum of the hypopygium is deeply emarginate posteriorly, and is separated from the sternum by a wide membranous suture (fig. 72). The sternum is almost entirely separated into two lateral plates by a deep, narrow, median notch occupied by membrane. A pleural sclerite is present as a rounded lobe on the upper posterior angle of each half of the sternum. There are three apical appendages on each side. The first is large and spatulate, bent posteriorly (figs. 72 and 74, A). The second and third arise from a common base. The second is an elongate cylindrical lobe with an enlarged head bearing a short hook (B). It is mostly concealed by the first. The third arises on the outer side of the base of the second and projects posteriorly. It is spoon-shaped, with the concavity inward.

The penis is unusually thick. In the ordinary condition it lies entirely within the genital chamber and reaches forward to the second abdominal segment. Figure 72 represents a specimen with the penis partly protruded. In this condition the anterior part of the bend lies in the fourth segment. The central vesicle is correspondingly small. The guard of the penis is a triangular plate (fig. 75), with two small lobes arising from its basal angles and converging above its base. With the base of the guard they form a collar like ring which surrounds the penis.

The anal tube is short, simple and strongly compressed.

Tipula spernax O. S. (Pl. XII, fig. 68).

The hypopygium has a simple form. The tergum and sternum are united. The latter is deeply cleft below by a narrow, median, seam-like, membranous line. There is a trace of a pleural suture present. On each side a line curves outward and upward from the notch in the sternum below and in front of the part corresponding with the pleurum of Group II. It has rather the appearance of a disappearing suture in this group, than of the suture characterizing Group I.

There are three apical appendages on each side (fig. 68). The first (A) is a wide, plain lobe, slightly convex outwardly and concave inwardly. The second (B) is wide at the base, rapidly tapering distally into a slender arm directed anteriorly. The third (C) has a large triangular base lying against the outer side of the base of the second. Distally it tapers into a slender arm abruptly bent forward.

Group III.

Neither pleural sutures nor pleural plates present.

It is conceivable that this may be a composite group. The lack of any pleural demarkation might be due either to the entire suppression of the pleural sutures of Group I, or to the obliteration of the sutures in front of the pleural plates of Group II. The species that fall into this division, however, are not primitive in other characters. For example, in several the entire hypopygial wall consists of one continuous plate. There are not only no separate pleural plates, but the tergum and sternum are fused. Hence, the species having the characters of this group are here placed together as representing the final evolution of the hypopygium in the genus *Tipula*.

In harmony with this view the genus *Ctenophora*, in which all the hypopygial plates are fused, follows *Tipula*.

Tipula fallax Loew (Pl. XVI, figs. 133, 135, 137, 138).

The hypopygium and the three segments preceding it form a large, oval, terminal enlargement of the abdomen, directed upward and posteriorly at an angle of about 45 degrees with the much slenderer part in front. The eighth sternum is very large and is produced posteriorly beneath the hypopygium. It tapers posteriorly to a truncate end where it bears three blunt, conical elevations, one median and two lateral, each of which is covered with a thick growth of short hair.

The hypopygium is unusually large through being greatly elongate (fig. 138). It resembles in an exaggerated degree the hypopygium of *Tipula truncorum*. The sides of the tergum are not fused with the sternum, and converge slightly posteriorly. The posterior margin is rounded. From beneath the margin, however, there projects downward a small, median, chitinous knob bearing a sharp slender tooth.

A ventral view of the hypopygium (fig. 135) shows clearly that it is constructed, with modifications, on the same plan as in *Tipula bella* (fig. 124) and *T. caloptera* (fig. 129). There is present anteriorly a large, shield-shaped, membranous area. Back of this area, however, there is a long continuously chitinous space intervening between the membranous area and the posterior notch of the sternum. This intervening chitinous space is evidently formed by the fusion of the edges of the narrow anterior part of the notch in other species. From its posterior margin there projects backward two long slender sinuous blade-like processes (fig. 135, *a*), each slightly curved upward at the tip.

There are no pleural sutures present in this species. The part of each lateral sternal plate corresponding with the pleurum is produced backward in a short, blunt point. Ventrad to this and close to the posterior margin is an oval, membranous fenestrum. From the sternal margin, ventrad to this, there arises a large appendage (figs. 135 and 138, *b*), consisting of a central body and three arms. One arm extends posteriorly and inward, the second inward, the third, which is much longer than the others, extends anteriorly and inward.

The apical appendages are simple (fig. 137). The dorsal one (A) is large and mostly conceals the others in a lateral view (fig. 138). The middle one (B) is densely chitinous and ends in a flat point. A lateral lobe projects over the outer edge from below. The lower appendage (C) is large, thick, fleshy and united basally with the second.

The apodemes of the central vesicle (fig. 133, *ap.*) are unusually long, being greatly larger than the anterior arms of the vesicle. The guard of the penis is a long, pointed, stylet-like structure, swollen at the base, grooved above. It arises from the floor of the genital chamber just above the bases of the long slender processes (*a*) that project from the edge of the sternum. The penis curves immediately downward from the central vesicle. In the specimen from which figure 138 was drawn it was projecting posteriorly from the hypopygium.

The anal tube has the usual form. A minute, chitinous tendon runs along its upper edge from the roof of the genital chamber.

Tipula illustris Doane (Pl. XII, figs. 61, 62, 63, 67).

The abdomen and hypopygium of this species have a very simple form externally. The eighth segment is cylindrical, with the sternum prolonged beneath the ninth.

The hypopygium is a simple cup set vertically upon the eighth segment, and may be mostly retracted within this segment. A longitudinal (vertical) suture on each side separates the tergum from the sternum (fig. 61). The sternum is continuous across the ventral aspect of the segment without any constriction (fig. 63). The pleura are fused with the sternum, and there are no pleural sutures.

There are only two apical appendages on each side. The first (figs. 61 and 62, A) is a conspicuous strap-like lobe rising vertically from the rim of the genital chamber but bent inward distally. The second appendage (fig. 62, B) is a wide irregularly triangular lobe with the two distal angles prolonged each into a long tapering horn-like process. This appendage is mostly concealed mesad of the first and within the genital chamber.

The penis and central vesicle have the ordinary form. The arms of the latter are rather short. The penis curves forward only into the posterior part of the eighth segment. The guard of the penis (fig. 67) has a wide, thick body which laterally bears two sharp lobes, and is mesially prolonged posteriorly into a slender tapering

process. A dorsal groove extending along this process and the body of the guard lodges the tip of the penis.

Tipula carinata Doane (Pl. XII, figs. 70, 71).

The tergum and sternum of the hypopygium are almost fused, the suture on each side being marked only by a faint, pale line. The sternum is widely and deeply notched below, but the anterior bridge of chitin is comparatively wide (fig. 70). The notch in the chitin is occupied by a membrane which forms also the posterior margin of the sternum. This membrane has a small median emargination on whose edges are two elongate chitinous plates.

There are only two apical appendages on each side (fig. 71). The first (A) is a slender slightly clavate lobe. The second (B) is thicker, bent forward, and has a flat, oblique distal end. A small lobe (C) on the outer edge of its base might be a rudimentary third appendage.

The guard of the penis is a slender tapering decurved structure, grooved above, and bearing two small points projecting downward and posteriorly from the base.

Tipula flavicans Fab (Pl. XIV, fig. 108).

The eighth segment is simple, its sternum is but little produced beneath the hypopygium. The abdomen gradually thickens posteriorly from the fifth segment.

The hypopygium is large and its walls are circularly continuous, there being no division into tergum, sternum or pleura, and the sternum is undivided below. The tergum is about twice as long as the lateral sternal and pleural parts. Its posterior border presents a rounded concavity above. The posterior, free, lateral margins are produced caudally as two large rounded lobes with serrated margins; each is very convex outwardly and concave inwardly (fig. 108, *a*). From the posterior border of the sternum there projects caudally a wide, flat, semi chitinous, median lobe (fig. 108, *b*) with a small rounded crest like elevation proximally on its upper side.

There are three apical appendages. The first (fig. 108, A) is small and spatulate. The second (B) arises just posterior to the first. It is wide and strongly curved forward. The third (C) is situated considerably below the others, and is double, consisting of an outer and an inner lobe. Both are curved dorsally and forward, the outer is slender and cylindrical, the inner wide and flattened.

The anal tube arises from the anterior wall of the genital chamber just below the lower edges of the posterior lateral tergal lobes. These two lobes on the sides, the anal tube below, and the under side of the tergum above, enclose a distinct dorsal division of the genital chamber between them. A narrow rod of chitin extends across its roof between the anterior ends of the tergal lobes. From this bar there hangs downward in the chamber a free bifid chitinous rod.

The central vesicle is of the ordinary shape. It is so situated, however, that its posterior arms project ventrally, and its anterior end is dorsal. Hence, the penis curves first dorsally and anteriorly from it. The guard of the penis is a short, curved appendage, thick basally, slender and pointed terminally, and grooved lengthwise on its upper surface.

Tipula sulphurea Doane (Pl. XII, fig. 66).

The hypopygium is externally of very simple structure. There is no division between tergum, sternum or pleurum, nor is there a pleural suture. The sternum is deeply emarginate, but each edge of the V-notch carries a narrow lobe attached along its entire length. The tergal margin bears two small median darkly chitinous knobs.

There are two apical lobes on each side. The first is short, slender, cylindrical and curved upward (fig. 66, A). The second (B) is wide and flat. On its outer side a flat lobe covers its anterior edge basally. Near the centre of the inner face there arises an unciform process that projects inward.

The penis curves immediately downward and posteriorly from the central vesicle. The guard is simple and stylet-like, with a dorsal groove.

Genus **CTENOPHORA** Meigen.

In the structure of the hypopygium this genus scarcely differs from some of the species in Group III of *Tipula*. It is placed at the top of the family by systematists, and logically following the system by which the species of *Pachyrrhina* and *Tipula* have been arranged in this paper, it must be assigned this position if classified by the structure of its hypopygium.

Ctenophora angustipennis Loew (Pl. X, figs. 46, 47, 48, 49).

The eighth segment is high and comparatively short, but is not specially modified, nor is its sternum produced beneath the hypopygium.

The body of the hypopygium is entirely undivided into tergum, sternum or pleura (fig. 49). The tergal part is very short (fig. 47), while the sternal part is correspondingly very large. Through this disproportion between the dorsal and ventral surfaces the posterior rim is almost horizontal and the genital chamber opens upward. The tergal region bears on each side a large horn-like process (figs. 47 and 49, *a*), the two diverging posteriorly and laterally. The sternum has a deep median notch on the posterior margin, but is not otherwise divided.

There are three apical appendages on each side. The first (figs. 47 and 49, A) is a large plate, convex outwardly and concave inwardly, also bent in the latter direction, and expanded and notched terminally. The second (fig. 49, B, and fig. 46) has a plate like basal part, but distally it tapers into a long, slender, densely chitinous and somewhat spatulate arm directed anteriorly within the first appendage. The third appendage is slender and angularly bent forward. It lies within the second and is entirely concealed in the genital chamber.

The central vesicle, penis and guard have the forms characteristic of *Tipula*. The penis makes a short curve forward into the eighth segment. The guard is a simple, compressed structure, with a deep, narrow, slit like, median groove along the dorsal surface.

The anal tube is the same as in *Tipula*.

SUMMARY.

If we assume that the primitive Tipulid hypopygium consisted of a tergum above, a sternum below, and of a pleural plate on each side intervening along the whole length of the segment between the tergum and the sternum, then we must adopt the phylogenetic outline followed in this paper. Briefly summarized this is as follows: There are two groups of species that present a primitive arrangement of the hypopygial sclerites. The first consists of the genus *Antocha* and of the section Limnobina. The second consists of the section Ptychopterina which includes *Bittacomorpha* and *Ptychoptera*. All of these forms have the pleura in the typical position just described. From the first group have been derived a series of forms consisting of the Limnobina Anomala, except *Antocha* (but including *Rhamphidia* and *Dicranoptycha*), the Eriopterina (*Trimicra, Symplecta, Erioptera*), the Limnophilina (*Limnophila, Epiphragma*), the Anisomerina (*Eriocera*), and the Amalopina (*Amalopis*). In this series the pleura have retracted from the anterior margin of the segment and have become exserted upon the posterior margin, appearing in most cases as appendages on the rim of the genital chamber. In *Antocha* and in the Limnobina (*Dicranomyia, Limnobia*) the apical appendages are born by the pleura, but, since these plates are here lateral, the appendages are on the hypopygial margin. In the forms with exserted pleura the apical appendages are, of course, born at the ends of the appendicular pleural lobes.

From the second primitively constructed group, represented by the Ptychopterina (which includes *Bittacomorpha* and *Ptychoptera*), is derivable the series formed by the Tipulina (*Pachyrrhina, Tipula, Ctenophora*). In some species of *Pachyrrhina* the pleura closely resemble the pleura in *Ptychoptera*, since they occupy the entire length of the side of the hypopygium. In most species of the genus, however, the anterior part of the suture between the pleurum and the sternum is obliterated. In many species its anterior end is bent upward for a very short distance at about the middle of the segment.

The lower members of *Tipula* resemble the higher forms of *Pachyrrhina* in having this "pleural suture" extending about half way to the anterior margin of the segment, and abruptly bent dorsally in a small terminal hook-like curve. In the majority of the

species of *Tipula* this short upward-bent arm of the suture is extended dorsally so as to cut off a small posterior plate behind it and above the horizontal arm. This plate always carries the apical appendages, and it may have its posterior angle produced into a long horn-like or spoon shaped process. In the most modified members of the genus the suture between the pleurum and the sternum disappears entirely. Furthermore, in many of these the sutures separating the tergum from the lateral parts disappear so that the body of the hypopygium is entirely undivided into plates of any sort.

Ctenophora resembles these highest forms of *Tipula*, for the hypopygium has continuous walls showing neither tergal, sternal nor pleural sclerites.

In the introduction to this paper the author has disclaimed the notion that the plates called "pleura" are homologues of the lateral plates of the thorax. All that is here attempted is to show that an apparent homology can be traced between the lateral plates of the hypopygium in such genera as *Antocha*, *Dicranomyia*, *Ptychoptera*, etc., the large appendicular and appendage-bearing lobes of the hypopygium of *Dicranoptycha*, *Erioptera*, *Limnophila*, *Amalopis*, etc., and the small posterior lateral plates of the hypopygium of *Tipula*. Since these plates or lobes primitively have a "pleural" position they have been called for convenience the *pleura*.

It may be imagined that the evolution has been in an opposite direction from that suggested. Starting with a small secondary plate cut off from each posterior upper angle of the sternum, we could imagine that the suture in front of it disappeared, and that the suture below it then extended forward until it separated off from the sternum a longitudinal plate between the ventral part of the sternum and the tergum, producing the forms thus characterized. By enlarging in the opposite direction this same small posterior plate could be easily transformed into an appendicular lobe, thus giving rise to the forms having this character. However, the fact, that following the line of the first assumption produces an arrangement of the genera almost identical with that followed by systematists using other characters for a guide, would seem to confirm the view adopted in this paper. The classification of the Tipulidæ by Osten Sacken in his Catalogue of North American Diptera is almost the same as would be a classification based on the hypopygium alone, if

we assume that the structure of this organ is most primitive in such genera as *Antocha*, *Dicranomyia* and *Limnobia*.

The variation of the internal features of the hypopygium is less important than that of the external. In all the genera below the Tipulina the penis is a straight, or slightly curved, tubular rod arising from the floor of the genital chamber and projecting straight backward. In the Tipulina it arises from the roof of the genital chamber. Its base is swollen to produce the central vesicle, while the rest is a slender, often hair-like tube curving anteriorly, ventrally and then posteriorly, making often a long loop forward. Its tip is in all cases protected by a guard. This latter structure is typically composed of two slender, longitudinal plates set close together on edge, with their lower margins united by membrane. In the lower genera often the entire penis lies in the groove of the guard. In the Tipulina it protects the tip when retracted, and guides the penis when being protruded. From above the base of the penis or the base of the guard, especially in the lower genera, there projects caudally a pair of arm-like processes which are often forked. If we count the guard as two processes, since it is so often composed of two slender plates united by their lower edges, then, with the dorsal pair, we have four processes arising about the base of the penis, one pair being above its base and the other below. It is evident that we may regard these structures as the homologues of the four *free* arms that arise about the base of the penis in a similar manner in some other Dipteran families. These have been termed the male gonapophyses, and so we may call the dorsal processes in the Tipulidæ the second or upper gonapophyses.

No attempt has been made in this paper to speculate upon the function of the parts of the hypopygium, or upon the cause of their evolution into such varied forms. The latter would afford a most interesting field for investigation. With all the striking diversification of the male parts, there is almost no variation in the genital parts of the females. Throughout the entire family the females present one type of structure,* of which there is but little modification, and certainly none to correspond with the great variety of specific differences found in the genitalia of the males.

* Journal N. Y. Entom. Soc. *Terminal segments of female Tipulidæ* (MS.) R. E. Snodgrass.

EXPLANATION OF THE PLATES.

Explanation of the Lettering.

The letters *a*, *b*, *c*, etc., are repeated on different figures to refer to miscellaneous structures that have no definite names and which are described in the text. The other symbols used are abbreviations, and are explained in the following :—*an.*, anus; *ap.*, apodeme; *ap. ap.*, apical appendage; *ap. aps.*, apical appendages; *a. t.*, anal tube; *br.*, V-shaped brace between the posterior arms of the central vesicle; *c. v.*, central vesicle; *ej. d.*, ejaculatory duct; *g. c.*, genital chamber; *gon. 2*, second gonapophyses; *p.*, penis; *p. g.*, guard of penis; *pl.*, pleurum; *r.*, rectum; *s.*, sternum; *t.*, tergum; A, first apical appendage; B, second apical appendage; C, third apical appendage; H, hypopygium; VII, VIII, IX, seventh, eighth and ninth abdominal segments.

Explanation of the Figures.

PLATE VIII.

Fig. 1. *Dicranomyia venusta*, lateral view of terminal part of abdomen.
" 2. " *longipennis*, guard of penis (*p. g.*) and second gonapophyses (*gon. 2*), left view.
" 3. *Antocha* sp. ?, penis, dorsal view.
" 4. *Dicranomyia longipennis*, terminal part of abdomen, dorsal view.
" 5. *Antocha opalizans*, terminal half of abdomen, lateral view, x 25.
" 6. *Antocha* sp. ?, guard of penis, dorsal view.
" 7. " sp. ?, second gonapophyses of left side, lateral view.
" 8. " *opalizans*, guard of penis, dorsal view.
" 9. *Trimicra anomala*, terminal part of abdomen, dorsal view.
" 10. *Symplecta punctipennis*, second gonapophyses and their apodemes (*ap.*), dorsal view.
" 11. *Antocha opalizans*, second gonapophyses of left side, lateral view.
" 12. *Symplecta punctipennis*, terminal part of abdomen, dorsal view.

PLATE IX.

Fig. 13. *Epiphragma forcipennis*, distal half of abdomen, lateral view, x 20.
" 14. *Limnophila cubitalis*, terminal half of abdomen, lateral view.
" 15. *Epiphragma forcipennis*, second gonapophyses of left side and its apodeme (*ap.*) lateral view.
" 16. *Limnobia sciophila*, terminal part of abdomen, lateral view, x 22½.
" 17. *Limnophila rufibasis*, guard of penis, left side, showing position of penis (*p.*) within.
" 18. *Limnophila quadrata*, terminal part of abdomen, dorsal view, x 25.
" 19. *Limnobia sciophila*, apical appendage of hypopygium.
" 20. " " guard of penis (*p. g.*) and second gonapophyses (*gon.* 2), ventral view.
" 21. *Limnophila rufibasis*, base of penis, dorsal view.
" 22. " " left apical appendage of hypopygium, lateral view.
" 23. " " terminal part of abdomen, dorsal view, x 18.
" 24. *Amalopis constans*, sternum, ventral view.
" 25. *Limnophila rufibasis*, second gonapophyses of left side.
" 26. *Amalopis constans*, dorsal view of hypopygium with appendages removed.
" 27. " *ampla*, left apical appendage of hypopygium, lateral view.
" 28. " " sternum of hypopygium, ventral view.
" 29. " " tergum of hypopygium, dorsal view.
" 30. " " terminal part of abdomen, lateral view, x 15.
" 31. " *constans*, left apical appendage of hypopygium, inner view.
" 32. " " terminal part of abdomen, lateral view, x 15.

PLATE X.

Fig. 33. *Limnobia sciophila*, terminal part of abdomen, dorsal view, x 25.
" 34. *Limnophila quadrata*, guard of penis (*p. g.*) and second gonapophyses of left side (*gon.* 2) with its apodeme (*ap.*), left view.
" 35. *Bittacomorpha clavipes*, hypopygium, left side ; *m*, intersegmental membrane between eighth segment and hypopygium.
" 36. *Bittacomorpha clavipes*, guard of penis with penis projecting, dorsal view.
" 37. " " tergum of hypopygium, dorsal view.
" 38. " " sternum of hypopygium, ventral view.
" 39. " " left pleurum of hypopygium with base of apical appendage attached (*ap. ap.*) and dorsal transverse process.
" 40. *Ptychoptera lenis*, terminal part of abdomen, lateral view.
" 41. " " tergum of hypopygium, dorsal view.
" 42. " " penis, dorsal view.
" 43. *Ctenophora angustipennis*, left lower apical appendage of hypopygium, external view.
" 44. *Ptychoptera lenis*, left sternal lobe of hypopygium, lateral view.
" 45. " " left apical appendage of hypopygium, lateral view.
" 46. *Ctenophora angustipennis*, left middle apical appendage of hypopygium, lateral view.
" 47. *Ctenophora angustipennis*, hypopygium, dorsal view.
" 48. " " guard of penis, left view.
" 49. " " terminal part of abdomen, lateral view, x 10.

PLATE XI.

Fig. 50. *Pachyrrhina polymera*, apical appendages of left side, outer view.
" 51. " *lugens*, terminal half of abdomen, lateral view.
" 52. " *incurva*, central vesicle (*c. v.*), penis (*p.*) and guard of penis (*p. g.*), left view.
" 53. *Pachyrrhina incurva*, terminal part of abdomen, lateral view.
" 54. " *lugens*, apical appendages of left side, outer view.
" 55. " *ferruginea*, guard of penis (*p. g.*) and second gonapophyses (*gon. 2*) with their apodemes (*ap.*), dorsal view
" 56. *Pachyrrhina ferruginea*, hypopygium, left view; *m*, intersegmental membrane between eighth segment and hypopygium.
" 57. *Pachyrrhina pedunculata*, central vesicle (*c. v.*), penis (*p.*) and guard of penis (*p. g.*), left view.
" 58. *Pachyrrhina pedunculata*, apical appendages of left side, outer view.
" 59. " " apical half of abdomen, lateral view.
" 60. " *polymera*, terminal part of abdomen, lateral view.

PLATE XII.

Fig. 61. *Tipula illustris*, distal half of abdomen, lateral view, x 18.
" 62. " " apical appendages of left side, outer view.
" 63. " " ventral view of hypopygium.
" 64. " *fumosa*, terminal part of abdomen, lateral view, x 20.
" 65. " " apical appendages of left side, outer view.
" 66. " *sulphurea*, apical appendages of left side, outer view.
" 67. " *illustris*, guard of penis, dorsal view.
" 68. " *spernax*, apical appendages of left side, outer view
" 69. " *brevicollis*, sternum and pleural plates of hypopygium, ventral view.
" 70. " *carinata*, hypopygium with appendages removed, ventral view.
" 71. " " apical appendages of left side, outer view.
" 72. " *dorsolineata*, terminal part of abdomen, lateral view, x 15; *p.* penis projecting from genital chamber.
" 73. " *lamellata*, tergum of hypopygium, dorsal view.
" 74. " *dorsolineata*, apical appendages of left side, outer view.
" 75. " " guard of penis, dorsal view.
" 76. " *lamellata*, apical appendage of left side, outer view.
" 77. " " apical half of abdomen, lateral view, x 10.

PLATE XIII.

Fig. 78. *Tipula æqualis*, distal half of abdomen, lateral view, x 15.
" 79. " " apical appendages of left side, outer view.
" 80. " *cineracea*, terminal part of abdomen, lateral view, x 15.
" 81. " " guard of penis, dorsal view.
" 82. " *cineracea*, guard of penis, lateral view.
" 83. " " apical appendages of left side, outer view.

Fig. 84. *Tipula retusa*, terminal part of abdomen, lateral view, x 10.
" 85. " " apical appendages of left side, outer view.
" 86. " " tergum of hypopygium, dorsal view.
" 87. " " guard of penis, lateral view.
" 88. " " central vesicle (*c. v.*) and penis (*p.*).
" 89. " *inermis*, apical appendages of left side, outer view.
" 90. " " anal tube, or tenth segment.
" 91. " " distal half of abdomen, lateral view, x 10.
" 92. " " sternum of eighth segment, ventral view.
" 93. " " guard of penis, dorsal view.

PLATE XIV.

Fig. 94. *Tipula bicornis*, distal half of abdomen, lateral view, x 10.
" 95. " " guard of penis (*p. g.*) and supporting framework.
" 96. " " lateral lobe of ninth sternum.
" 97. " " central vesicle (*c. v.*) and base of penis (*p.*) ventral view.
" 98. " " apical appendages of left side, outer view.
" 99. " " guard of penis (*p. g.*) and its supporting framework.
" 100. " " ventral plate of anal tube.
" 101. " " tergum of hypopygium, dorsal view.
" 102. " *streptocera*, hypopygium, dorsal view.
" 103. " " terminal part of abdomen, lateral view, x 10.
" 104. " *bisetosa*, apical appendages of left side, outer view.
" 105. " *streptocera*, apical appendages of left side, outer view.
" 106. " *bisetosa*, distal half of abdomen, lateral view, x 10.
" 107. " " guard of penis (*p. g.*) and appendages below it.
" 108. " *flaricans*, distal half of abdomen, lateral view, x 10.

PLATE XV.

Fig. 109. *Tipula unicincta*, distal half of abdomen, lateral view, x 10.
" 110. " " apical appendages of left side, outer view.
" 111. " " guard of penis (*p. g.*) and appendages below it.
" 112. " *acuta*, apical appendages of left side, outer view.
" 113. " " eighth sternum of abdomen, ventral view.
" 114. " *unicincta*, posterior end of eighth abdominal sternum, anterior (*i. e.* dorsal) view.
" 115. " *acuta*, ventral appendages of ninth abdominal sternum.
" 116. " " guard of penis, dorsal view.
" 117. " " tergum of hypopygium, dorsal view.
" 118. " *tephrocephala*, terminal part of abdomen, lateral view, x 10.
" 119. " *tricolor*, terminal part of abdomen, lateral view, x 10.
" 120. " *tephrocephala*, tergum of hypopygium, dorsal view.
" 121. " *tricolor*, apical appendages of left side, outer view.
" 122. " *tephrocephala*, apical appendages of left side, outer view.

PLATE XVI.

Fig. 123. *Tipula bella*, terminal part of abdomen, lateral view, x 23.
" 124. " " ventral view of hypopygium with appendages removed.
" 125. " " central vesicle (*c. v.*) and penis (*p*), left view.
" 126. " " guard of penis (*p. g.*) and appendages attached to its base.
" 127. " " apical appendages of left side, outer view.
" 128. " *caloptera*, distal half of abdomen, lateral view, x 10.
" 129. " " ventral view of hypopygium with appendages removed.
" 130. " " dorsal view of hypopygium.
" 131. " " guard of penis (*p. g.*) and attached appendages.
" 132 " *truncorum*, terminal part of abdomen, lateral view, x 10.
" 133. " *fallax*, central vesicle (*c. v.*) and basal part of penis (*p.*).
" 134. " *truncorum*, apical appendages of left side, outer view.
" 135. " *fallax*, ventral view of hypopygium.
" 136. " *incisa*, apical appendages of left side, outer view.
" 137. " *fallax*, apical appendages of left side, outer view.
" 138 " " distal half of abdomen, lateral view, x 10.

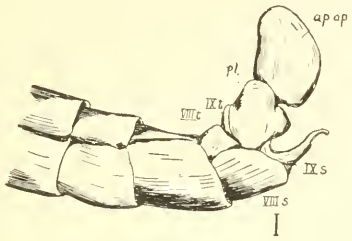
PLATE XVII.

Fig. 139. *Tipula angustipennis*, abdomen, lateral view, x 5.
" 140. " " middle and lower apical appendages, outer view.
" 141. " " dorsal view of hypopygium.
" 142. " " lateral view of hypopygium.
" 143. " " upper apical appendage of left side, outer view.
" 144. " " central vesicle (*c. v.*) and penis (*p.*), left side.
" 145. " " guard of penis, dorsal view.
" 146. " " central vesicle (*c. v.*) and penis (*p.*), ventral view.
" 147. " " ventral view of hypopygium.
" 148. " " v-shaped bar in roof of genital chamber lying between posterior arms of central vesicle.

Fig. 149. *Tipula angustipennis*, terminal part of abdomen, lateral view, with left side of eighth and ninth segments removed, x 15; *an.*, anus; *a. t.*, anal tube or tenth segment; *c. v.*, central vesicle; *ej. d.*, ejaculatory duct; *g. c.*, genital chamber; *p.*, penis; *p. g.*, guard of penis; *r.*, rectum.

PLATE XVIII.

Fig. 150. *Tipula trivitta*, central vesicle (*c. v.*) and penis (*p.*), left side.
" 151. " " guard of penis, left side.
" 152. " " ventral view of bent bar lying between posterior arms of central vesicle.
" 153. *Tipula trivitta*, apical appendages of left side, outer view.
" 154. " *cognata*, left view of hypopygium; *m*, intersegmental membrane between eighth segment and hypopygium.
" 155. *Tipula cognata*, ventral view of hypopygium with appendages removed.
" 156. " *spectabilis*, tergum of hypopygium, dorsal view.
" 157. " *cognata*, apical appendages of left side, outer view.
" 158. " *spectabilis*, guard of penis, left side.
" 159. " " apical appendage of left side, outer view.
" 160. " " distal half of abdomen, lateral view, x 10.
" 161. " " ventral view of hypopygium.



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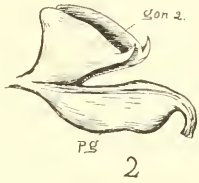

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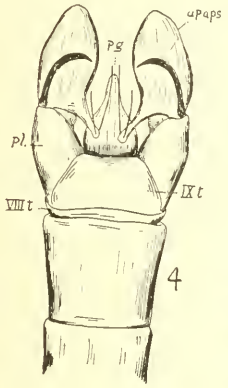

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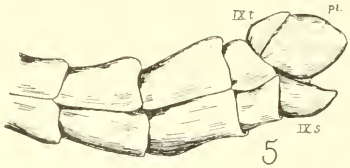

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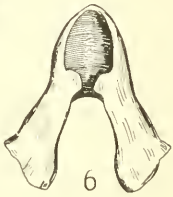

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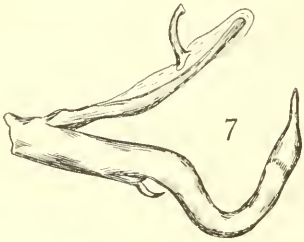

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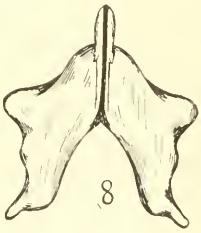

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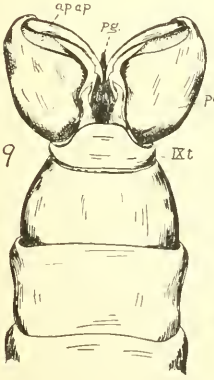

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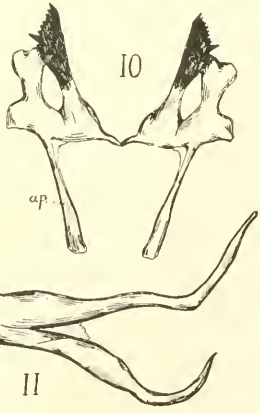

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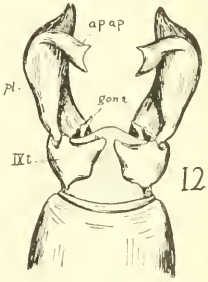

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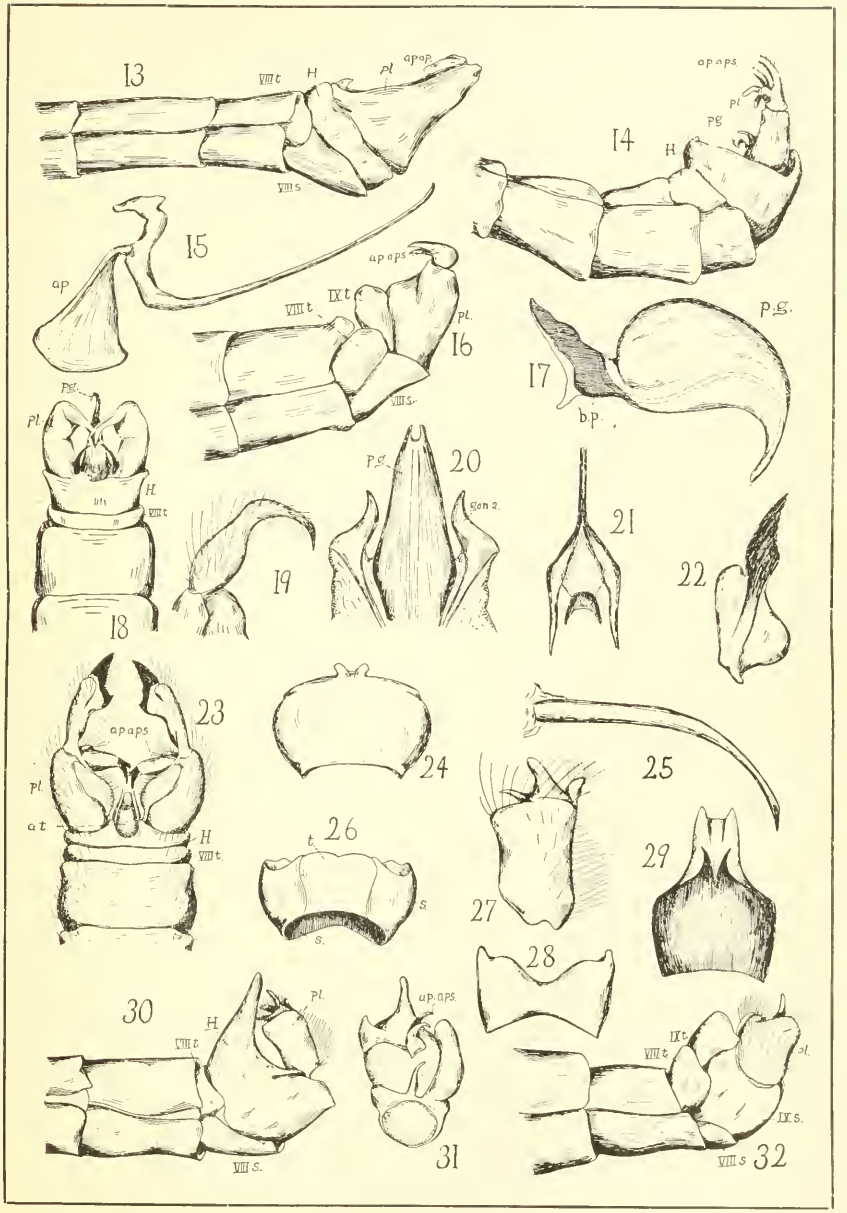
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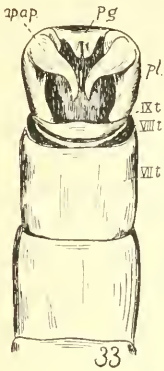

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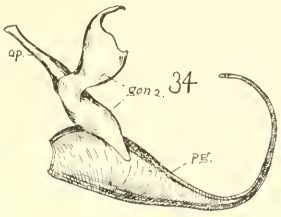

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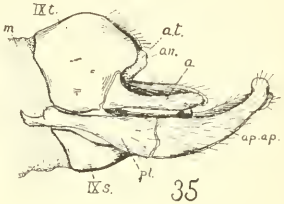

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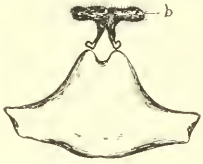

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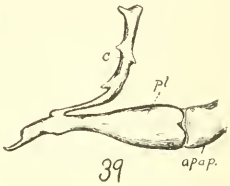

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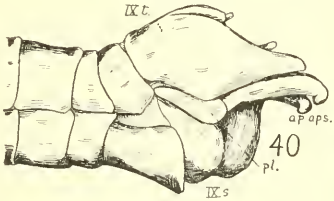

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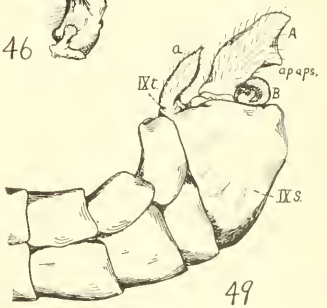

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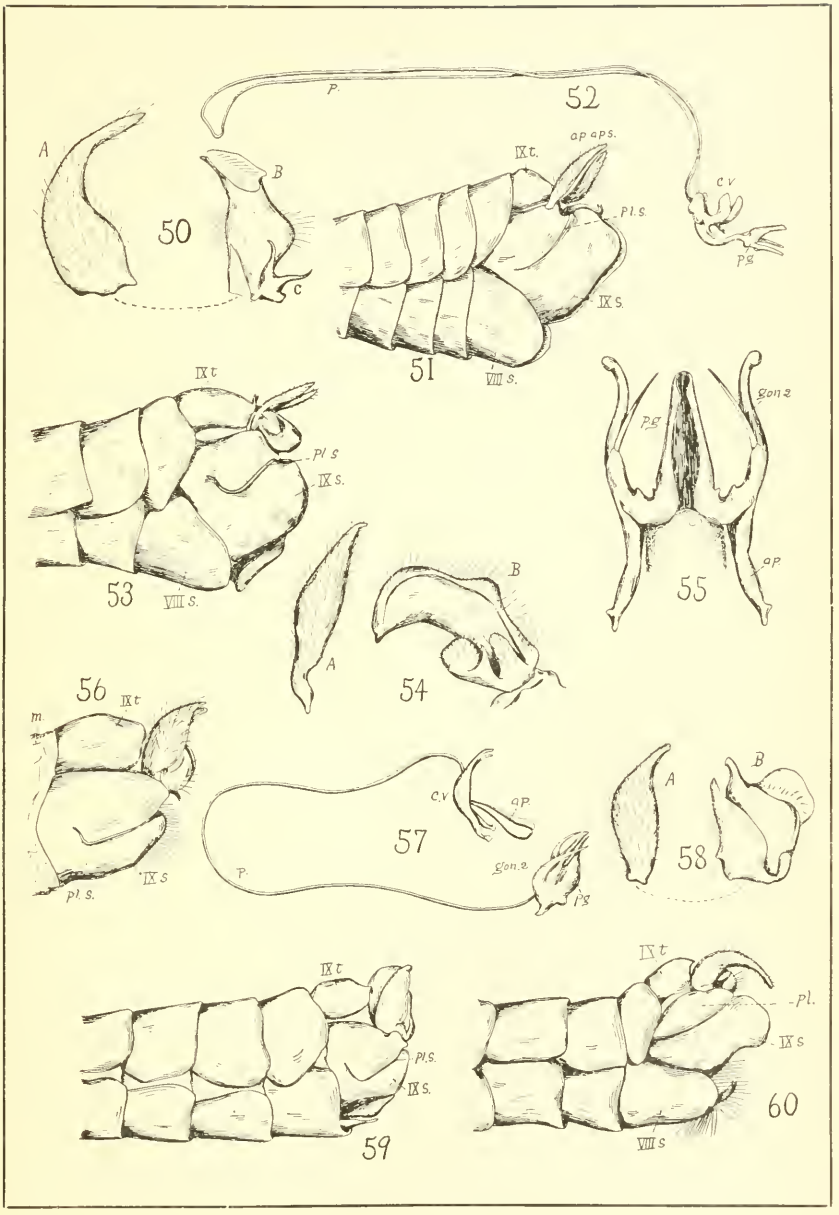
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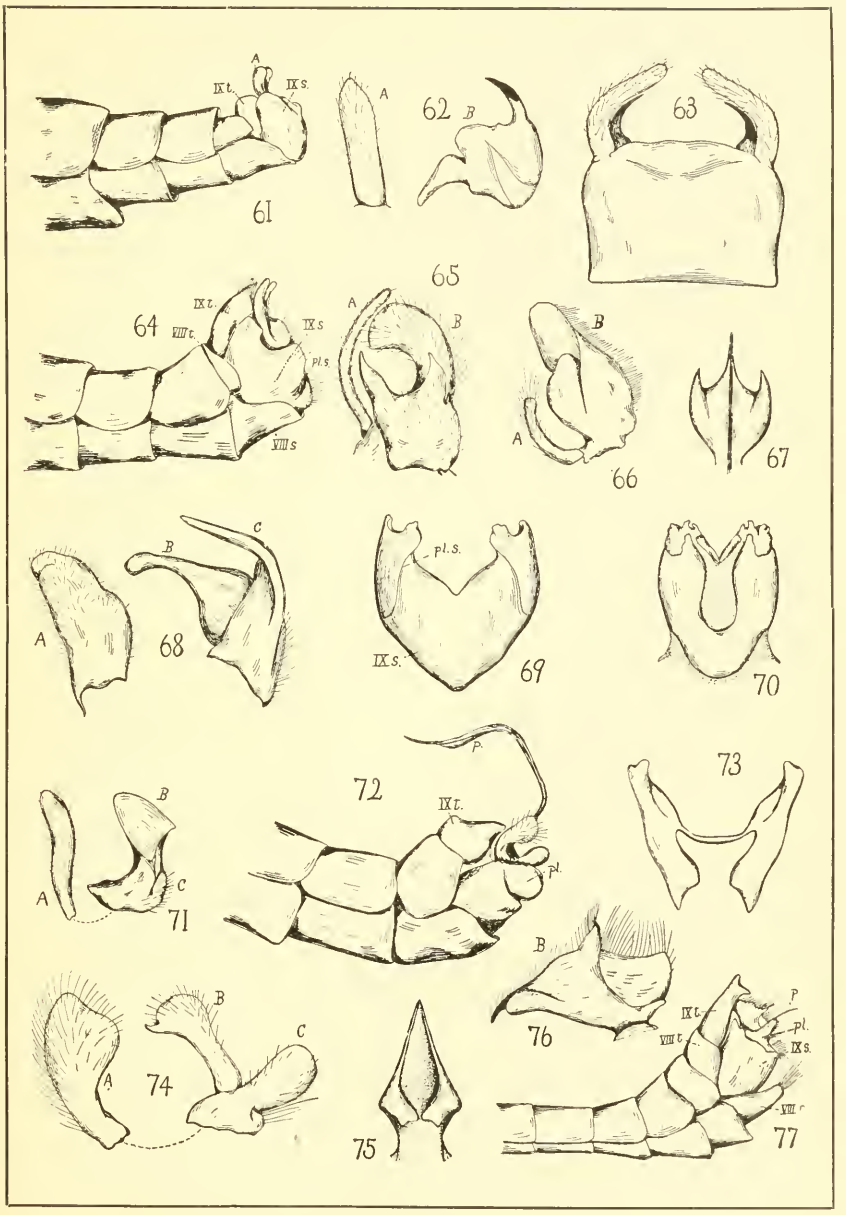
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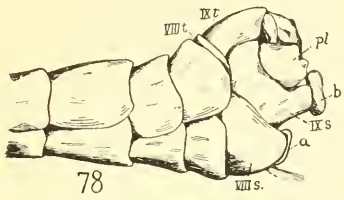

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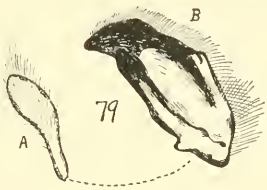

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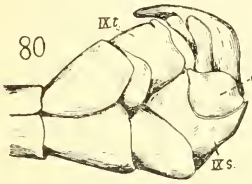

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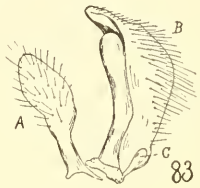

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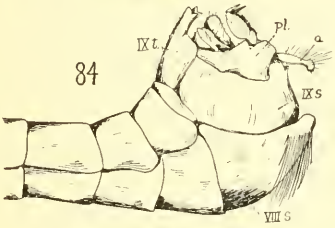

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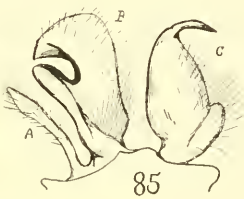

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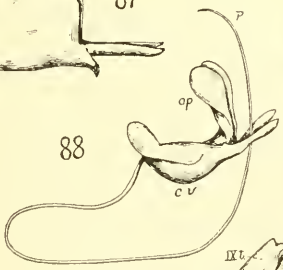

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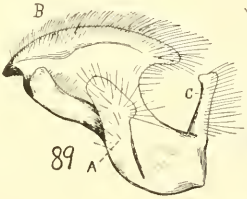

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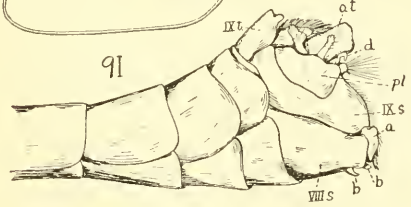

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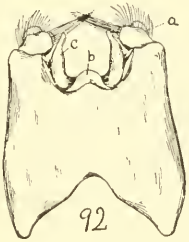

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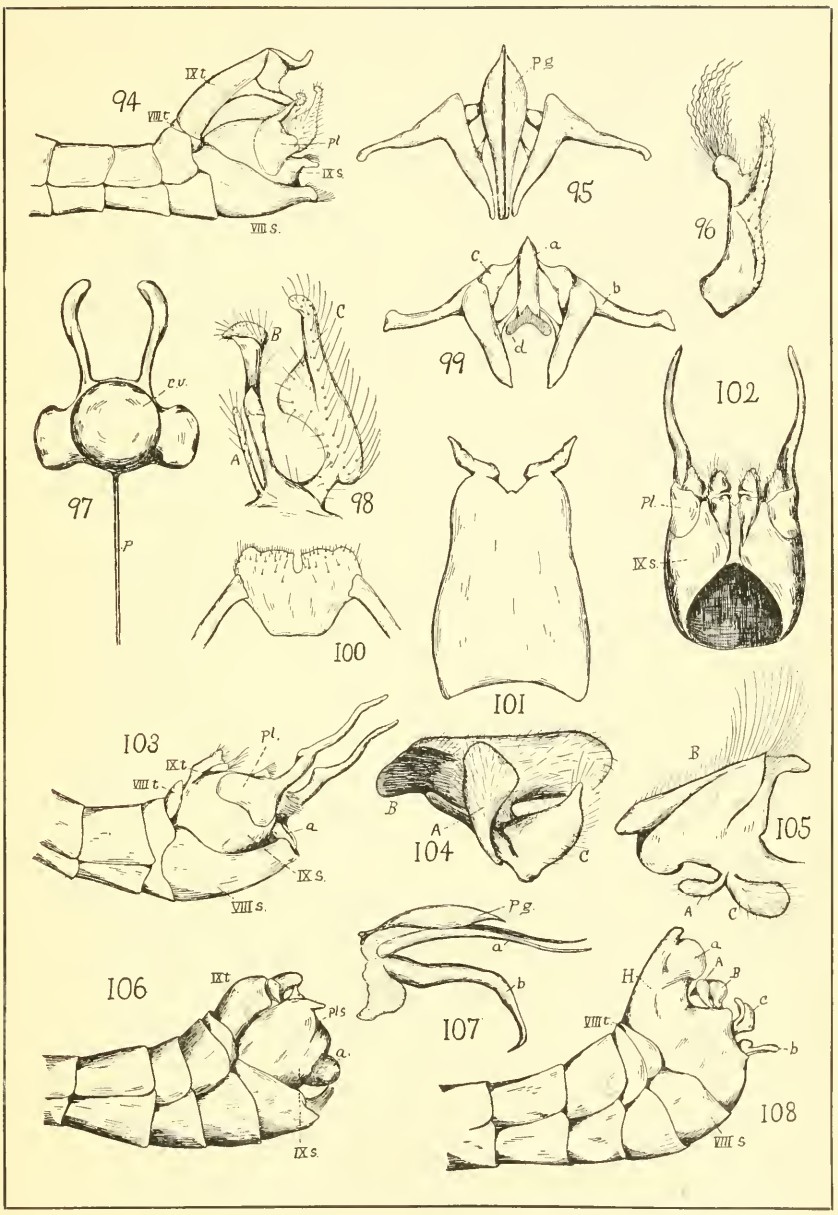
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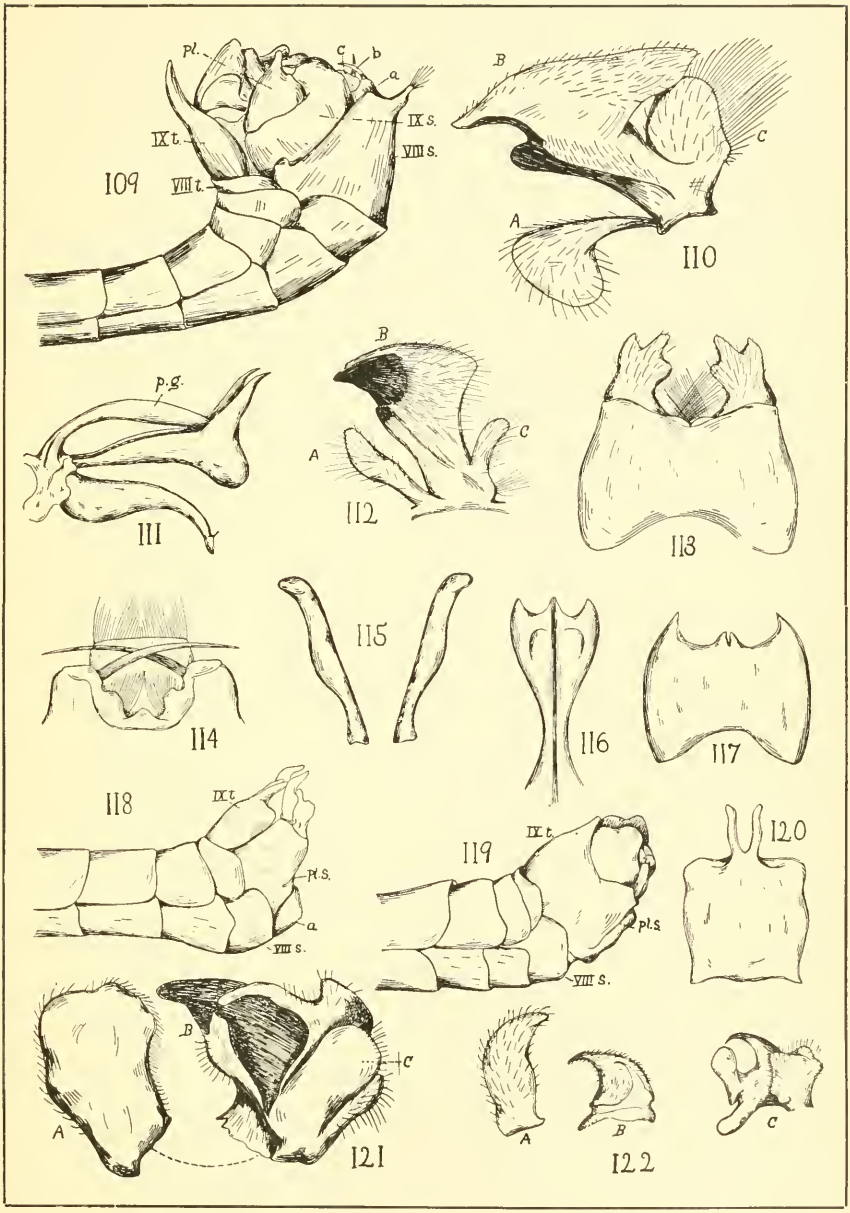
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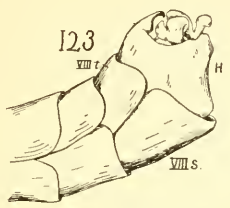
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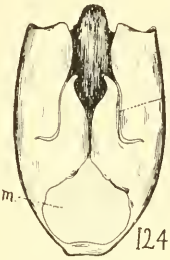
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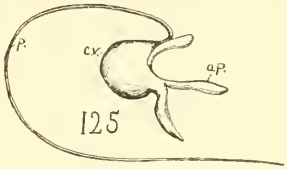
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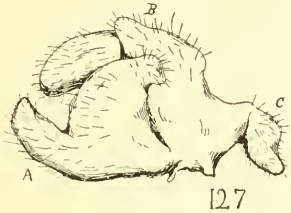
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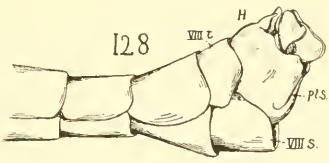
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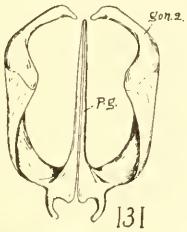
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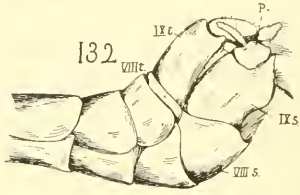
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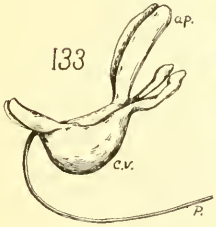
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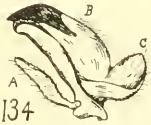
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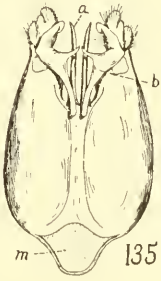
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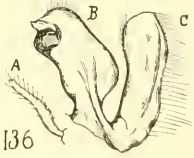
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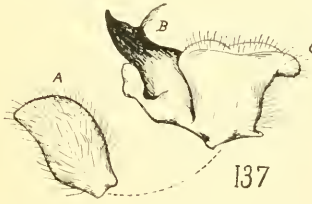
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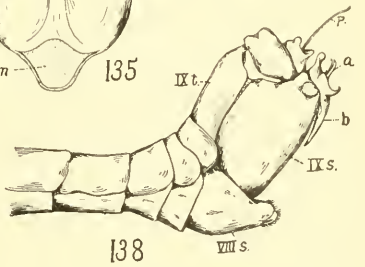
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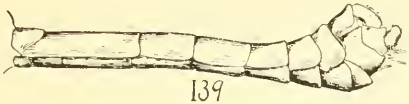

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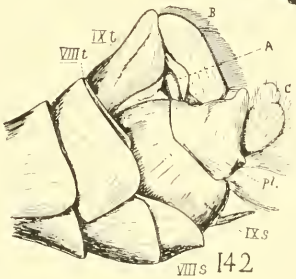

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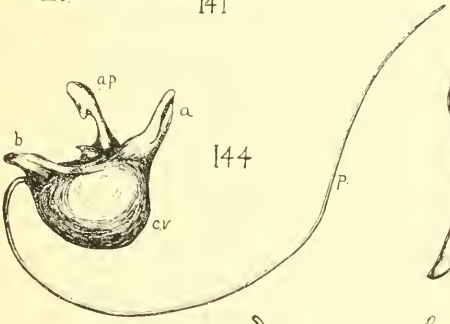

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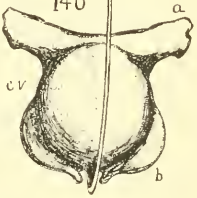

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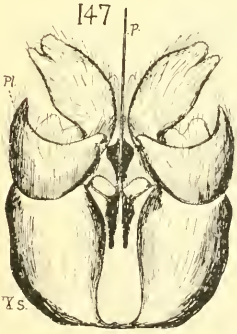

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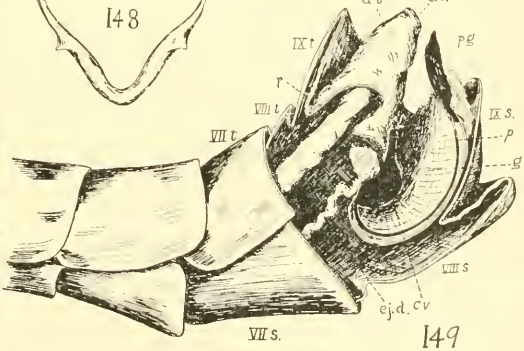

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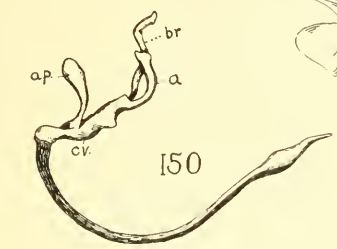

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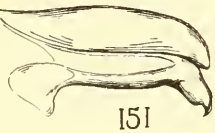
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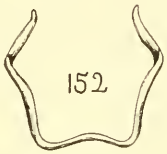
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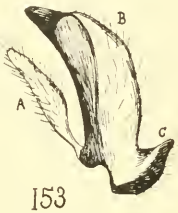

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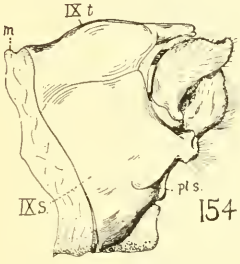

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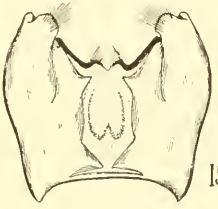
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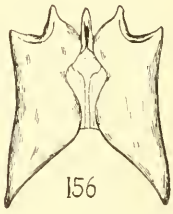
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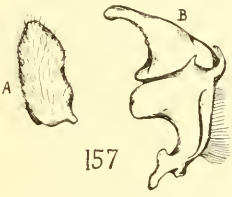

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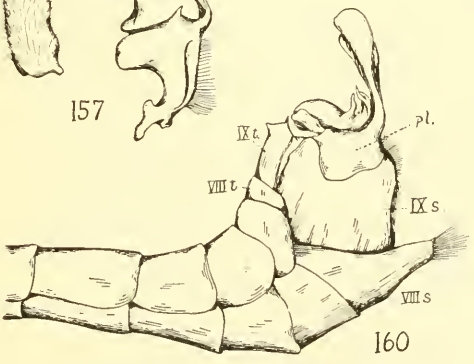

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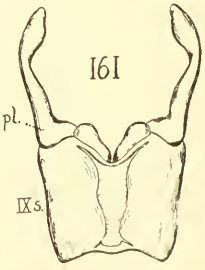

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ADDITIONS TO SPHEGOIDEA (HYMENOPTERA).

BY HENRY L. VIERECK.

NYSSONIDÆ.

Nysson submellipes n. sp.

Near to *mellipes*, differing chiefly in the curved unevenly spaced ridges on the metathorax and by the salient ridge bounding the superior border of the posterior face of the rather distinctly truncate metathorax.

♂. 8 mm. long. *Head.*—Front protuberant, with rather shallow adjoining punctures and no raised line; ocelli as if set in around a node, distance between posterior ocelli a little less than that between them and nearest eye margin; cheek unmargined, with separated punctures; clypeus convex, smooth, indistinctly punctured and covered with dense appressed silvery pubescence; face along the eye margin up to the emargination and between the antennæ pubescent like the clypeus, a blunt projection between the antennæ; scape nearly oblong, a little shorter than the next three joints of the antenna together; pedicellum a little longer than the first joint of the flagellum; joints of the flagellum subequal, terminal joint obtuse at tip, penultimate joint simple.

Thorax.—Dorsulum punctured much like the front; scutellum more coarsely punctured than the dorsulum; punctures on mesopleura not so deep as on the dorsulum; spines of the metathorax short and stout, directed upward and outward; superior face of the metathorax, in the middle, with regular, strong ridges, posterior face of the metathorax with fine, dull, reticulate, longitudinal areas surmounted by a rather shining, uneven, transverse area which separates the superior from the posterior face; legs smooth, posterior tibiæ not spinose; wings dark brownish with purple reflections, nervures black; transverse median nervure terminating a little beyond the basal nervure, third transverse cubitus joining the marginal cell where the petiole of the second submarginal cell joins the marginal cell, second submarginal cell almost forming an obtuse triangle.

Abdomen.—Punctures on the first abdominal segment rather deep, distinctly defined and close together, the punctures of the succeeding segments smaller but denser; integument dull, sericeous; the two teeth at apex of abdomen short.

Black; mandibles reddish except at base and apex; legs reddish, infuscated at base; scape partly reddish; pronotum, tubercles, transverse irregular band on the scutellum and bands on segments 1, 2, 3 and 4 of abdomen yellow, the band on the first segment nearly interrupted, on segments 2 and 3 broadly interrupted, on the fourth segment represented by dots; tegulæ partly brownish.

Type locality, Riverton, New Jersey. Type, Acad. Nat. Sci., Phila. August 7, 1901 (C. W. Johnson).

Nysson tramosericus n. sp.

Nearest to *albomarginatus*, from which it differs at once by the

greater distance between the insertion of the anal nervure and the cubitus on the median nervure and by the stronger sculpture of the metathorax, the ridges being strong, and by the shorter metathoracic spines which are blunt.

♂. 6 mm. long. *Head.*—Front not appreciably protuberant, punctured as in *submellipes;* distance between posterior ocelli distinctly less than that between them and nearest eye margin; cheek unmargined, about as closely punctured as the front; clypeus and face as in *submellipes;* scape rather cylindrical, the proportion between the joints of antenna about as in *submellipes,* terminal joint slightly truncate, penultimate joint not produced.

Thorax.—Dorsulum punctured much like the front; scutellum with the punctures not so deep nor coarser than on the dorsulum; mesopleura punctured much like the dorsulum; metathorax with short, blunt spines directed outward and upward, superior face with rather coarse ridges not widely separated, posterior face sculptured nearly as in *submellipes.* Wings colored much as in *submellipes,* but not quite so dark; transverse median nervure distinctly beyond the basal nervure; third transverse cubitus joining the marginal cell more than the length of the petiole from the insertion of the petiole in the marginal cell; legs as in *submellipes.*

Abdomen.—Punctures on the first abdominal segment rather shallow and indistinctly defined, punctures on the second segment smaller than on the first and third, on the fourth segment the punctures are larger than on the third; segments 5, 6 and 7 with punctures like those on 4, each segment more densely punctured than the other, apical segment almost rugose, spines sharp and slender.

Black; mandibles faintly castaneous, tip of the scape brownish, apex of femora, and the tibiæ especially at base and apex reddish to brownish testaceous, the tibiæ between basal and apical thirds more or less infuscated; first three segments banded as in *submellipes,* segments 4 and 5 with lateral dots, one on each side; pronotum with a transverse line on the middle occupying one-half its width; tubercles and a spot on the scutellum yellow.

Type locality, Lehigh Gap, Pennsylvania. Type, Acad. Nat. Sci. Phila. June 30, 1901, on *Achillea millefolium* flowers (H. L. Viereck).

Nyssondæckei n. sp.

Allied to *fidelis,* from which it differs at once in the first joint of the flagellum being hardly longer than the second joint.

♂. 5 mm. long. *Head.*—Front not at all protuberant, punctures very fine and adjoining giving a dull granular appearance; ocelli not exactly as if set in around a node; cheek unmargined, punctured like the front vertex and occiput; clypeus orange, its sculpture hidden by the dense appressed silvery pubescence; scape almond shaped, the outer half reddish orange; pedicellum and flagellum as in *submellipes,* but the terminal joint excavated beneath and truncate at the tip, penultimate joint slightly produced at tip beneath.

Thorax.—Dorsulum punctured like the front; punctures coarser on the scutellum than on the dorsulum; mesopleura dull, reticulated; metathorax with very

short sharp spines directed outward and upward, superior face with nearly straight ridges placed close together, only the central ridges prominent on the posterior face which is reticulated; wings brownish irridescent, nervures black, venation nearly as in *tramosericus;* legs smooth, posterior tibiæ not spinose.

Abdomen.—First three segments with rather sparse, small, shallow punctures on a minutely punctured surface, on the apical segments the minute punctures become prominent and the larger shallow punctures almost disappear; spines of apical segment very short and blunt

Black; pronotum with a median spot, tubercles, a short line on each side of segments 1, 2 and 3 at apex, and a dot on each side of segment 4 yellowish white, four anterior tibiæ with a whitish line in front.

Type locality, Lucaston, New Jersey. Type, Acad. Nat. Sci. Phila. May 30, 1902 (E. Daecke).

CRABRONIDÆ.

Entomognathus lenapeorum n. sp.

♀. 5 mm. long. *Head.*—Polished, punctures rather sparse and small, a semilunar depression between the lateral ocellus and the eye, the frontal impression represented by a shallow pit; joints of the flagellum subequal, pedicellum equal to the first joint of the flagellum or a little longer; ocelli forming a low triangle, distance between posterior pair distinctly greater than the distance between them and the nearest eye margin.

Thorax.—Pronotum smooth and rounded, apparently impunctate; dorsulum with indistinct parapsidal grooves and sparse setigerous punctures; scutellum punctured much like the dorsulum; pleura very finely and sparsely punctured; metathorax with the superior face deeply pitted and with irregular strong rugæ, posterior face rugulose and wtth a median triangular smooth depression; wings clear, slightly brownish, the nervures and stigma black, transverse median nervure a little basad of interstitial with the basal nervure, the recurrent nervure enters the submarginal cell a little beyond the middle, as does the transverse cubitus enter the marginal cell.

Abdomen.—Largely impunctate, the penultimate dorsal segment densely punctured, the pygidium more densely punctured than the segment preceding; second ventral segment rather sparsely punctured.

Black; scape with a line in front; tubercles and four anterior tibiæ in front yellow, tarsi and spurs brownish. Face below antennæ covered with dense silvery pubescence, the other parts of the insect covered with thin pubescence that does not hide the surface, the pubescence more abundant on the legs than on the body.

Type locality, Lehigh Gap, Pennsylvania. Type, Acad. Nat. Sci., Phila. July 29, 1901.

Anothyreus panurgoides n. sp.

Related to *A. (Crabro) æqualis*, but differs in the more even punctuation of the dorsulum and particularly by the first segment ap-

proaching a triangular outline not parallel sided. The male would seem to be related to group *niditiventris* of Fox, from which it differs at once by the abscence of convex enclosures on the superior face of the metathorax.

♂. 7.5 mm. long. *Head.*—Closely, finely, indistinctly punctured, especially on the front; distance between posterior ocelli less than the distance between the lateral ocellus and the eye margin; the distance between the eyes at base of clypeus is greater than the clypeus is high. Clypeus convex, with the surface hidden by dense appressed pubescence, the anterior margin slightly sinuate, not dentate; first joint of flagellum a little shorter than 2 and 3.

Thorax.—Pronotum rounded almost impunctate, the anterior lateral angles feebly bluntly spinose; dorsulum with rather indistinct small setigerous punctures adjoining on the sides, separated in the middle; mesopleura with the punctures a little larger than those on the dorsulum, and sparse episternal sutures strongly foveolate; punctures on the scutellum smaller and sparser than on the dorsulum; postscutellum rough, apparently impunctate; metathorax on the superior face with a median almost hexagonal enclosure, surrounded by strong ridges, broader at base than at the apex, outside of this enclosure the sculpture is irregular reticulate, the ridges far apart the surface between shining, posterior face of the metathorax dull, with a median longitudinal enclosure marked off by weak ridges and about four times as long as wide. Metapleura polished, impunctate, with a short ridge just above the inferior margin; wings brownish, the nervures and stigma dark brown, transverse median nervure distinctly basad of the basal nervure, recurrent nervure entering the submarginal cell distinctly beyond the middle, transverse cubitus entering the marginal cell in the middle.

Abdomen.—First two segments almost impunctate, the remaining segments rather densely punctured with minute, indistinct, setigerous punctures; pygidium coarsely, closely punctured, the apical half covered with appressed bristles.

Black; a large part of the scape, mandibles except base and apex, four anterior legs with tibiæ in front and basal joint of tarsi, posterior legs with apical two-thirds of tibiæ in front and basal joint of tarsi yellow, tubercles, a short line on each side of the pronotum, a spot on the scutellum, a more or less broadly interrupted band on segments 1, 2, 3 and 4 yellow, spurs, claws and all except basal joint of tarsi brownish.

♂. 6 mm. long. *Head.*—Front, vertex and occiput apparently impunctate, the cheeks with fine setigerous punctures; distance between posterior ocelli greater than the distance between the lateral ocellus and nearest eye margin; clypeus convex, basal half dull rugulose, apical half shining, the sculpture not quite hidden by the dense appressed silvery pubescence; first joint of flagellum about as long as the second.

Thorax.—Pronotum rounded not angulate; dorsulum impunctate except for the very fine setigerous punctures; mesopleura sculptured much like the dorsulum; postscutellum apparently impunctate, polished; metathorax irregularly reticulate, posterior face with the ridges not so sharp and with a median V-shaped polished enclosure; metapleura irregularly striate; wings brownish, the nervures and stigma black.

Abdomen.—Dorsally with very minute setigerous punctures; penultimate seg-

ment densely, coarsely punctured, apical segment more coarsely and not so densely punctured as the preceding.

Black; scape, clypeus in the middle of the anterior half, mandibles at base, tubercles, four anterior femora in front, four posterior legs with tibiæ and basal joint of tarsi and a spot on each side of the first four abdominal segments yellow, anterior tibiæ, and the tarsi otherwise brownish testaceous.

Type locality, Lehigh Gap, Pennsylvania. Type, Acad. Nat. Sci. Philadelphia- June 25, 26, 1901.

Paranothyreus rugicollis n. sp.

Nearest to *snowi*, but distinguished by rugose pronotum and the shining quadrate pits of the metanotum.

♂. 7.5 mm. long. *Head.*—Front impressed, sparsely punctured, the punctures small and setigerous, space between and just back of posterior ocelli coarsely punctured, cheeks rather densely finely punctured; distance between posterior ocelli greater than the distance between the lateral ocellus and the eye margin; distance between the eyes at base of clypeus less than the clypeus is high; clypeus yellow, the sculpture hidden by the dense, appressed, silvery pubescence; first joint of antenna distinctly longer than the second, but shorter than the second and third together.

Thorax.—Pronotum rugose, the anterior lateral angles strongly produced; dorsulum with dense, small, setigerous punctures distinctly separated in the middle, nearly adjoining on the sides; mesopleura with the punctures much finer and sparser than on the dorsulum; scutellum with the punctures larger and sparser than on the dorsulum; postscutellum roughened, apparently impunctate; superior face of metathorax with a medial row of quadrate pits, outside of this the surface is irregularly reticulate, posterior face with a median cuneate sulcus bounded on each side by a series of quadrate pits; metapleura smooth, almost polished; wings clear, slightly brownish, nervures and stigma dark brown, transverse median nervure distinctly basad of the basal nervure, recurrent nervure received by the submarginal cell a little before the middle.

Abdomen.—Covered with microscopic, indistinctly defined, setigerous punctures, the penultimate and apical segments rather distinctly punctured.

Black; scape except posterior face, mandibles except the apex, tubercles, anterior femora except a broad line posteriorly, middle femora beneath and on the apical half of the superior face, four anterior tibiæ except a spot beneath at apex, posterior tibiæ in front, basal joint of tarsi, the trochanters wholly or in part and segments 1, 2, 3, 4 and 5 with a more or less broadly interrupted band yellow, tegulæ, claws, and the tarsi except basal joint more or less brownish, the tarsi somewhat fuscous.

Type locality, Riverton, New Jersey. Type, Acad. Nat. Sci. Phila. July 8, 1901 (C. W. Johnson).

Stenocrabro nelli n. sp.

Related to *sulcus*, but differs in the opaque almost impunctate

integument. Can be recognized at once by the median tarsi being all yellow.

♀. *Head* and thorax together 3 mm. long. Head dullish, with a few scattered punctures, cheeks finely densely punctured; distance between posterior ocelli less than than the distance between them and nearest eye margin; distance between the eyes at base of clypeus about equal to the height of the clypeus; clypeus nearly flat, the surface hidden by dense, appressed, silvery pubescence; first joint of the flagellum a little shorter than the second, joints of the flagellum subequal.

Thorax.—Pronotum dull, smooth and rounded; dorsulum dull, apparently impunctate; mesopleura dull, with sparse minute punctures; scutellum dull, apparently densely, very finely punctured; postscutellum dull, finely roughened, apparently impunctate; superior face of metathorax divided into two nearly triangular spaces by a medial foveate line and separated from the adjacent areas of the metathorax by foveate lines, posterior face dull, with a median cuneate space, rugulose at base, smooth at apex; metapleura dull, impunctate: wings clear tinged with brown, nervures and stigma very dark brown, transverse median nervure distinctly basad of the basal nervure, recurrent nervure entering the submarginal cell in the middle or nearly, transverse cubitus entering the marginal cell distinctly basad of the middle.

Abdomen lost.

Black; scape in front, four anterior tibiæ except a line on the posterior face and base of posterior tibiæ yellow, tarsi of four anterior legs whitish, apical joints and claws brownish, mandibles and posterior tibiæ partly castaneous.

Type locality, Philadelphia (Frankford), Pennsylvania. Type, Acad. Nat. Sci. Phila. June 23, 1898 (P. Nell).

Stenocrabro flavitrochantericus n. sp.

♀. 5 mm. long. *Head.*—Dull, with fine, dense, indistinct punctures; distance between posterior ocelli distinctly less than the distance between the lateral ocellus and the nearest eye margin; clypeus yellow, rather elevated in the middle, surface hidden by dense appressed silvery pubescence.

Thorax.—Pronotum dull, with a transverse channel; dorsulum dull, densely, finely punctured; mesopleura rather shining, closely, finely punctured; scutellum sculptured much like the dorsulum; superior face of the metathorax divided into two nearly triangular spaces by a medial cuneate space, the base of which is at the base of the metathorax and the apex adjoining the foveate line separating the superior from the posterior face, posterior face shining, with a deep median sulcus; metapleura polished, impunctate; wings clear tinged with brownish, nervures and stigma nearly black; transverse medial nervure distinctly basad of the basal nervure, the recurrent nervure entering the submarginal cell basad of the middle, transverse cubitus distinctly basad of the middle of the marginal cell.

Abdomen shining, minutely punctured, penultimate segment with dense not sharply defined punctures, pygidium with coarse punctures.

Black; scape except a black line on the posterior face, mandibles except at apex, tubercles, line on pronotum, spot on the scutellum, trochanters, four an-

terior tibiæ except on the posterior face, base of posterior tibiæ yellow, tarsi except the brownish apical joints whitish, apex of mandibles brown.

Type locality, Riverton, New Jersey. Type, Acad. Nat. Sci. Phila. June 6 (C. W. Johnson).

Diodontus crassicornus n. sp.

Related to *rugosus*. The antennæ are thicker than in any other North American species of this genus.

♂. 4 mm. long. General form compact. *Head.*—Very finely sculptured and with numerous indistinct punctures rather close together, sculpture of the lower half of the face hidden by appressed silvery pubescence; cheeks broad and gently rounded; ocelli forming a low triangle, the distance between the posterior ocelli a little greater than the distance between the lateral ocellus and the nearest eye margin; antennæ dull sericeus, joints of the flagellum subequal, terminal joint longest, nearly as long as the first two joints together, all except the terminal joint nearly as thick as long, flagellum somewhat serrated on the under side; labrum deeply broadly emarginate.

Thorax.—Pronotum roughened, rather angular; dorsulum rather densely punctured, with punctures like on the front; scutellum sculptured like the dorsulum; pleura rugulose, the metapleura rather striated; metathorax irregularly reticulate, with an indistinct pit in the middle of the superior half of the posterior face, no distinctly toothed lateral margin; legs smooth, the posterior tibiæ with strong bristles on the posterior margin; wings clear, slightly smoky, nervures and stigma dark brown, the latter nearly black, transverse median nervure nearly interstitial with the basal nervure, first recurrent nervure joining the first submarginal cell about one-third its length on the cubitus from the first transverse cubitus, second recurrent nervure joining the second submarginal cell in the middle; the second submarginal cell about three times as broad on the cubitus as on the radius.

Abdomen very minutely punctured and dullish, the sutures rather constricted. Black; mandibles except at apex yellow; legs largely brownish ochreous, middle and posterior femora black except at tips; about one-half of the anterior femora colored like the tibiæ.

Thinly indistinctly sericeous, the apical abdominal segments rather distinctly sericeous.

Type locality, Corvallis, Oregon. Type, Acad. Nat. Sci. Phila. July 7, 1896 (A. B. Cordley).

Passalaecus rivertonensis n. sp.

Allied to *annulatus*, but differs in having the parapsidal furrows faint, not foveolate; length of the cubitus between the first recurrent nervure and the first transverse cubitus less than half the length of the first transverse cubitus.

♂. 5 mm. long. *Head.*—Front finely granular; vertex with fine separated punctures on a shining surface; frontal impression not distinct; ocelli situated

in indistinct pits, distance between the posterior ocelli less than the distance between the lateral ocellus and nearest eye margin; antennal joints subequal, second joint longer than the first, third longer than the fourth, terminal joint longest, pointed at the tip.

Thorax.—Dorsulum dull, closely finely punctured, with rather indistinct parapsidal grooves; scutellum and postscutellum shining, not so distinctly punctured as the dorsulum; metathorax irregularly reticulate, smooth and shining between the raised lines, metapleura dull and granular.

Abdomen.—Shining finely punctured. Covered with thin pubescence, face and mesopleura more densely pubescent than the rest of the body, the clypeus especially densely covered with appressed silvery pubescence.

Black; antennæ with yellow rings at the apex of the segments, scape in front and mandibles yellow, palpi and tubercles whitish, tegulæ brown, nervures and stigma black or nearly.

Type locality, Riverton, New Jersey. Type, Acad. Nat. Sci. Phila. June 17th (C. W. Johnson).

The North American Cuckoo Wasps of the Genus PARNOPES.

BY HENRY L. VIERECK.

In the preparation of this paper types of all species, except *chrysoprasina* Smith, and *fulvicornis* Cameron have been examined. For the loan of *aglaspidula* and *westcotti* the writer is indebted to Mr. A. L. Melander.

KEY TO SPECIES.

Postscutellum entire ..... 1.
Postscutellum notched ..... 2.

1. Greenish, tinged with blue, sometimes blue, sometimes tinged with copper; terminal segment more triangular. In the ♂ there is a punctured suture between the pronotum and mesonotum; 10 mm. or less. **edwardsii.**
   Blue, tinged with green, terminal segment more quadrate. In the ♂ there is a broad granular suture between the pronotum and mesonotum; 10 to 12.5 mm ..... **hageni.**
   Royal blue; 8–9 mm ..... **henshawi.**
2. Apical segment of abdomen with a median carina, terminating anteriorly in a narrow smooth space posteriorly separating the two subapical grooves ..... 3.
   No median carina on apical segment ..... 4.
3. Blue and green; tegulæ entirely blue and green ..... **aglaspidula.**
   Cupreous and green, tegulæ with a narrow yellow margin ..... **concinna.**
   Blue and green and cupreous, tegula sienna, with a yellow margin.. **festiva.**
4. Tegulæ yellow ..... 5.
   Tegulæ dark ..... 6.
5. Cupreous, with green reflections ..... **diadema.**
   Green, with cupreous reflections ..... **westcottii.**
6. Tegulæ black, with a pale margin ..... **chrysoprasina.**
   Tegulæ largely yellow, dark on disc ..... 7.
7. Small species, with distinct silvery bands of pubescence ..... **taeniata.**
   Large species, with no silvery bands ..... 8.
8. Process of postscutellum quadrate, with a short narrow notch, process not distinctly elevated ..... **excurvata.**

The size (9 mm.), fulvous postscutellum and bluish abdomen of *fulvicornis* are sufficient indications that this species is distinct from any other North American form.

Parnopes edwardsii Cress.

June 27, 1882, Camp Umatilla, Washington (Henshaw). A male and female, deep blue.

Parnopes hageni n. sp.

♀. 12 mm. *Head.*—Face with a cuneiform flat depression, of which the base lies between the insertion of the antennæ, and the apex about in the middle of the space between the anterior ocellus and the antennæ, a shining punctured cuneiform space diverges obliquely to each side of the central depression; the rest of the face with contiguous punctures like on the cheeks; punctures of clypeus contiguous, but smaller than those on the face, the sides of the clypeus convex, its anterior margin curved in, no posterior nor lateral suture; malar space present but not higher than the terminal joint of the flagellum is wide.

Thorax.—Pronotum seen from above presents three lateral points, an anterior and posterior, and the third one-fourth the length of the pronotum from the anterior point and extending laterad further than the anterior point, surface of pronotum uneven, punctures contiguous, from one-half to again as large as those on the head; mesonotum narrower behind than in front, punctured like the pronotum, parapsidal grooves distinctly arched posteriorly, straight anteriorly separating the median dark space from the parapsides, median dark space rugulose, punctured like the cheeks, and near the posterior border punctured like the parapsides, posterior half of parapsides with a slight longitudinal depression; punctures of tegulæ strong, partly contiguous, partly separated; mesopleura triangular, with sharp edges, sculpture like the pronotum and with an oblique narrow space reticulated; scutellum sharply separated from the mesonotum and postscutellum, postlateral edges rugulose, otherwise punctured like the pronotum or nearly, a deep oval pit on each side near the tegulæ; postscutellum with a quadrate produced portion extending slightly upward and backward nearly beyond the metathorax, the produced portion sculptured much like the scutellum, the edge sharp, sides of postscutellum rugulose, separated from the metathorax by a slight ridge, process as broad at apex as at base.

Abdomen.—First abdominal segment about three times as broad as long, slightly narrower anteriorly than posteriorly, anterior edge curved, deeply depressed in three places, the median depression deepest, on the disc is a smooth space; disc with large irregularly separated punctures on the sides, the punctures are adjoining and decidedly smaller than on the disc; second segment not quite so long as the first, punctures on the anterior margin shallow small and adjoining the rest of the segment like the first, the posterior lateral angles produced into a sharper tooth than the corresponding angles on the first, a median longitudinal impunctate space is present; third segment as long as the first and second, its brownish nonspinose edge (corresponding to the lateral brownish edges of the second segment) extending about as far as the length of the second segment, and to this extent the sides of the third segment are parallel; beyond the abdomen forms a rather obtuse angle which is rounded; the edge is irregularly spinose and has about twenty short blunt visible spines, depressions deep, parallel, with the oblique edges of the segment and about one-third as long as the segment, punctures adjoining, except at base and apex, where they are separated by smooth spaces, a narrow longitudinal impunctate space on the dark portion of the third segment.

Color.—Deep blue to purple, with greenish reflections and tints, base of segments purple and blackish, clypeus and mesonotum anteriorly black, the black part of mesonotum with two faint longitudinal raised lines extending back from the anterior margin, flagellum and greater part of mandibles and venter black, middle of mandibles and all tarsi brownish.

Covered with silvery pubescence, which is most apparent on the face.

♂. 12.5 mm. First abdominal segment about four times as wide as long and without a median impunctate space; second segment distinctly shorter than the first, median space hardly indicated; third segment a little longer than the second, with only a suggestion of a smooth space; edge of fourth segment with the spines stronger and more abundant than in the female.

Type locality, Yakima City, Washington. Type, Mus. Comp. Zool. Camb. ♀, July 2, 3, 4, 1882, Yakima City, Wash.; June 27, 1882, Camp Umatilla, Wash. ♂, June 30, 1882, Lone Tree, Yakima River, Wash.; June 27, 1882, Camp Umatilla, Wash.; June 25, 1882, Umatilla, Or. (Hagen and Henshaw).

Parnopes henshawi n. sp.

♀. 9 mm. *Head.*—With no cuneiform shining punctured area diverging from the central cuneiform depression.

Thorax.—Parapsidal grooves distinct, the sculpture of the space between the parapsidal grooves anteriorly not very different from the sculpture of the parapsides as in *hageni*, except on the extreme anterior border where the sculpture is close and the integument blackish; oblique oblong reticulate space of the mesopleura bounded by a sharp ridge behind; postscutellum broader at base than at apex.

Abdomen.—First abdominal segment about three times as broad as long, with a slight median impunctate space; second abdominal segment with the median longitudinal impunctate space starting as a rugulose depression, no impunctate space on the third segment.

Color.—Almost entirely purple or blue, tibiæ with some green, tarsi various shades of brown, flagellum and mandibles black and brown.

Silvery pubescence most abundant on the head.

♂.—Scutellum not so sharply separated from the mesonotum as from the postscutellum, punctured so as to appear reticulate, the lateral oval pit and small space adjoining finely rugulose; postscutellum with the quadrate production extending outwards and slightly upwards, gently rounded, wider than long, not excavated on the superior plane, but imperfectly reticulate.

Abdomen.—First segment about three times as broad as long, slightly narrower anteriorly than posteriorly, anterior edge curved, not deeply depressed in three places, only slightly punctured as in *hageni;* second abdominal segment as in *hageni*, but the median impunctate space is replaced by a densely punctured, dull, slight groove, distinctly depressed one-fourth; a median densely punctured, dull groove extending over the third segment, distinctly depressed one-fourth; only about twelve prominent spines on the edge of the apical segment.

Color.—Purple and blue, tibiæ and mandibles partly, tarsi entirely brownish, flagellum black.

Pubescent, with silvery hairs, most abundant on the head, nowhere hiding the sculpture.

Type locality, Umatilla, Oregon. Type, Mus. Comp Zool. Camb. ♀, June 24, 1882, Umatilla, Or.; June 27, 1882, Camp Umatilla,

Wash.; June 24, 1882, Umatilla, Or.; June 27, 1882, Camp Umatilla, Wash.

Parnopes aglaspidula Mel. and Brues.

♀, July 13, 1900, Lehigh Gap, Lehigh Co., Pa.

Parnopes concinna n. sp.

♀. 10 mm. *Head.*—The depression above the insertion of the antennæ not triangular, but forming a smooth basin with a median impunctate line; malar space practically wanting.

Thorax.—Pronotum seen from above presenting only two lateral points forming the anterior and posterior corners; parapsidal grooves absent, median black space more closely punctured than the rest of the remaining parts of the mesonotum; mesonotum and mesopleura as in *hageni;* scutellum not sharply separated from mesonotum; postscutellum as in *hageni.*

Abdomen.—First segment rather deeply depressed in three places, otherwise as in *henshawi;* second segment with a median longitudinal impunctate space, punctures larger than on the mesonotum, but separated; punctures of third abdominal segment adjoining and as coarse as on the second, no median impunctate space; terminal segment with about eighteen irregular spines on the edge, depressions as in *hageni,* punctures uniform, adjoining, except at the base, where they are separated.

Color.—Greenish, beautifully ornamented with copper color and coppery reflections, sutures and depressions of abdomen green, blue and purple. Thinly pubescent, distinct silvery lateral bands of appressed pubescence on segments one and two.

Type locality, Florence, Arizona. Type, Acad. Nat. Sci. Phila. ♀, May 23, 1903 (C. R. Biederman).

Parnopes diadema n. sp.

♀. 7 mm. *Head.*—Face concave, smooth, covered with a dense appressed pubescence; front with separated punctures and an irregular shallow pit; clypeus with rather indistinctly defined separated punctures; malar space inconspicuous.

Thorax.—Only an anterior and posterior point apparent on each side of the pronotum, pronotum with a distinct depression in the middle, mesonotum with no distinct parapsidal grooves, the median dark space uniformly but not so coarsely punctured as the parapsides; sculpture of mesopleura hidden by appressed silvery pubescence; sculpture of the posterior lateral corners of the scutellum hidden by appressed silvery pubescence, other parts of the scutellum punctured like the pronotum; process of postscutellum with parallel sides, the nonproduced part of the postscutellum hidden by appressed silvery pubescence.

Abdomen.—With a distinctly depressed margin on the segments; first segment deeply depressed only in the middle of the anterior face, no smooth space on the superior face, sculpture of the margin obscured by the appressed silvery pubescence, which is not so dense as on the mesopleura; second segment not so long as the first, sculpture and pubescence the same; third segment about as long as the preceding segments together, about thirteen strong spines on the apical mar-

gin which is pale brown, lateral margins pale, apical half of the segment, except extreme apex, with the sculpture hidden by appressed silvery pubescence.

The male differs from the female only in the usual sexual characters

Type locality, Florence, Arizona. Type, Acad. Nat. Sci. Phila. ♀, July 23, August 23, 1903; ♂, August 23, 1903, Florence, Arizona (C. R. Biederman).

Parnopes chrysoprasina Sm.

New Jersey.

Parnopes tæniata n. sp.

♀. 8 mm. *Head.*—Face as in *diadema*, front longitudinally depressed below the anterior ocellus; no malar space present.

Thorax.—Pronotum seen from above presents three lateral points, the middle one most pronounced, a depression filled with pubescence is present in the middle of the pronotum; mesonotum with visible but rather indistinct parapsidal grooves, punctures in the space between the parapsidal grooves smaller and closer than those on the parapsides; sculpture of mesopleura hidden by appressed silvery pubescence; posterior lateral corners of scutellum and sides of postscutellum as in *diadema*, process of the postscutellum a little broader at apex than at base.

Abdomen.—Segments with a sharply defined depressed margin; first segment visibly depressed in three places, the median depression deepest, no longitudinal smooth space, punctures large and separated, the margin or apical fourth of the segment rugulose, the sculpture nearly hidden by pubescence; segments two and three with the apical third rugulose and covered by pubescence, base of these segments with small punctures, medially with large punctures, apical third of third segment covered with dense pubescence, the margin testaceous and with about sixteen strong spines.

Color.—Blue, with some purple and greenish reflections, antennæ and legs largely testaceous, scape and femora blue.

Type locality, E. Washington. Type, Am. Ent. Soc. Phila.

Parnopes arizonensis n. sp.

♂. 10.5 mm. *Head.*—Face bare, depressed to form a shallow smooth polished basin; front punctured as strongly as the vertex and cheeks; no malar space.

Thorax.—Pronotum seen from above presenting an anterior and posterior lateral point, only a slight median depression anteriorly; parapsidal grooves on the mesonotum visible but not distinct, the punctures on the surface between them smaller and closer together than those on the parapsides; mesopleura bare or nearly traversed obliquely by a shallow channel; posterior lateral corners of the scutellum and sides of the postscutellum not densely pubescent; process of the postscutellum broader in the middle than at base or apex.

Abdomen.—The depressions on the anterior face of the first abdominal segment not very distinct, no long smooth space, punctures large and adjoining, depressed margin not sharply defined, nor is the nearly rugose sculptured area hidden by pubescence; second and third segments like the first; fourth segment with a black margin bearing about eleven strong spines, rounded at apex, not triangular in outline.

Color.—Green, with bluish reflections, sutures of abdomen deep blue and purple; antennæ black, scape green; legs brownish, tibiæ greenish, femora green.

Type locality, Florence, Arizona. Type, Acad. Nat. Sci. Phila. ♀, May 23, 30, 1903, Florence, Arizona (C. R. Biederman).

Parnopes excurvata n. sp.

♀. About 10 mm. long. *Head.*—Face pubescent but not densely, the depressed area punctured, the sculpture of the front above the end of the scape similar to that on vertex and cheeks; malar space present but not as long as the terminal joint of the flagellum.

Thorax.—Sides of the pronotum seen from above presenting an anterior and posterior point with a bulged portion between; mesonotum with indistinct parapsidal grooves, the space between more closely punctured than the parapsides; mesopleura pubescent, like the face in part at least, traversed by an oblique rather distinct fovea or groove; scutellum sharply separated from the adjoining segments, *i. e.*, with distinct sutures; process of postscutellum distinctly wider at apex than at base, the emargination not quite so wide as the prong; posterior lateral corners of the scutellum and sides of the postscutellum pubescent like the face.

Abdomen.—Anterior face of the first segment depressed in three places, the median depression very well marked; segments with small punctures at base, large separated punctures in the middle, no long median impunctate space; apical margins of segments rugulose and with a distinct narrow band of pubescence laterally; apical segment with the depressions filled with dense silvery pubescence and not very deep, beyond the depressions the segment is testaceous, the edge subemarginate, with about fifteen large spines.

Color.—Green, with bluish reflections; process of postscutellum black or nearly, antennæ and legs dark testaceous to brown, scape and femora darkest, and green on one side.

Type locality, Florence, Arizona. Type, Acad. Nat. Sci. Phila. Florence, Ariz. (C. R. Biederman).

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SUBSCRIPTION PRICE FOUR DOLLARS PER VOLUME.

Descriptions of New Genera and Species of HYMENOPTERA from Mexico.

BY P. CAMERON.

ICHNEUMONIDÆ.

ICHNEUMONINI.

Hoplismenus ? leptocerus sp. nov.

Scutellum roundly convex; the sides stoutly keeled to the middle. Median segment short, the apex straight, slightly oblique, the sides shortly toothed; the base depressed, the areola wider than long, transverse at the base, the apex slightly roundly curved inwardly; it is clearly separated from the petiolar area. The 2nd abdominal segment aciculated, the others smooth; the ovipositor largely projecting, as long as the last two segments united. Antennæ longer than the body, dilated towards the apex, the middle broadly ringed with white. Labrum projecting. Areolet 5-angled; disco-cubital nervure broken by a slight stump of a nervure; angled where it issues; the cubitus faint beyond the stigma. Tarsi long, the apices of the joints spinose. Ventral keel stout, extending to the base of the ovipositor. Apex of abdomen sharply pointed; there are 7 segments; the last is fully larger than the 6th.

The antennæ are longer than the body; the occiput is roundly emarginate; temples short, obliquely roundly narrowed; malar space distinct; abdominal petiole slender, not much dilated at the apex. The hind femora reach to the apex of the 4th abdominal segment. Radial cellule wide, not reaching much more than half way to the apex.

Yellow; a triangular spot covering the ocelli and prolonged down the front, becoming gradually narrowed, the greater part of the occiput, 3 broad lines on the mesonotum, the space at the sides of the scutellum, the base of the metanotum broadly, the posterior median area and the base of the meso- and metapleuræ, black. The back of the abdomen brownish, tinged with black, the apices of the 1st and 2nd segments broadly yellow; the others are more narrowly and obscurely yellow at their apices. Legs yellow, the hind femora and apical third of hind tibiæ brown; the other femora tinged with fulvous behind. Wings clear hyaline, the stigma testaceous, the nervures darker. Smooth and shining; the mesopleuræ in the centre and, to a less extent, the centre of the metanotum punctured. Areolet narrowed in front, but with the nervures clearly separated; the recurrent nervure received shortly beyond the middle. Length 5.5 mm.

Hab. Mexico.

As I cannot place this genus to my satisfaction I have given a generic and specific description of it. In Dr. Ashmead's table it fits best with *Hoplismenus*. It looks more like a Cryptid than an Ichneumonid. Probably it will form the type of a new genus.

PHÆOGENINI.

ERYTHROISCHNUS gen. nov.

Scutellum roundly convex, clearly raised above the level of the mesonotum, the sides stoutly keeled to the top of the apical slope. Parapsidal furrows wide, deep on the basal half of the mesonotum. Median segment deeply depressed in the middle at the base: without a petiolar area; the areola large, wider than long, of equal width, the sides rounded at the base, the apex transverse; spiracles minute, longer than wide. Areolet 5 angled; the disco cubital nervure unbroken; the transverse median nervure in hind wings broken near the bottom. Metapleura with a complete keel below. Post-petiole broad. Gastracœli narrow, but distinct. Legs stout; the hind coxæ large and thicker than usual, roundly dilated at the base. Abdomen broad, not much longer than the thorax, bluntly rounded at the apex. Mandibles long, narrow, bidentate at apex. The body is red, the antennæ annulated with white.

The only genus of the Phæogenini, with which the present could be confounded, is *Ischnus*, which has, like it, a convex and elevated scutellum; the two may be separated:

Scutellum strongly keeled to near the apex; areola wider than long, of equal width; post-petiole wide, clearly separated; color rufous, antennæ annulated with white..... **Erythroischnus.**

Scutellum keeled at base only; areola longer than wide, not of equal width throughout; post-petiole not very wide, not clearly separated; color black. **Ischnus.**

Erythroischnus annulicornis sp. nov.

Ferruginous; the flagellum of antennæ black, the 8 middle joints white; mandibles black; the upper part and apex of mesopleuræ, the base, sides and apex of the median segment, almost the apical half of the hind femora and the apical fourth of the hind tibiæ black; wings hyaline, the nervures and stigma black. ♂. Length 6 mm.

Head and thorax closely, regularly and strongly punctured, the scutellum and median segment with the punctures as distinct, but more widely separated; the posterior median area transversely striated. Pleuræ obscurely obliquely striated. Basal segments of abdomen closely punctured; the sides of post-petiole depressed. Prosternum black. Apex of clypeus broadly rounded, as is also the labrum. Antennæ stout, shorter than the body.

Hab.—Mexico.

MESSOTENINI.

Mesostenus rufus sp. nov.

Rufous; the head, prothorax and mesothorax, except on the pleuræ behind, black; the under side of antennal scape, face, clypeus, mandibles, the palpi, a

triangular mark on the front touching the eyes, prosternum, tegulæ, tubercles, base of pronotum and scutellum whitish yellow; legs rufo-fulvous, the hind tarsi fuscous, the 2nd joint white. Flagellum of antennæ dark fuscous. Wings hyaline, the stigma and nervures blackish. ♂. Length 4 5 mm.

Head, pro- and mesothorax smooth and shining; the metanotum between the keels irregularly longitudinally striated; the apical slope tinged with yellow, irregularly, obscurely striated. Mesopleuræ closely striated on the top at the apex; it is yellow there, and the mesosternum is for the greater part yellow; its base marked with black. Areolet minute, badly defined, open behind, where the recurrent nervure is received. Head wider than the thorax, the temples roundly narrowed. Parapsidal furrows distinct at the base only. Metapleural keel distinct. Scutellum roundly convex, its sides not margined. The thorax is three times longer than wide; the metathorax moderately large, the basal keel distinct; the 2nd distinct in the middle only. Abdominal petiole long, slender, not much dilated at the apex. Transverse median nervure in hind wings angularly broken below the middle.

Hab.—Mexico.

This species does not look like a *Mesostenus*, but as it fits the characters of that genus, as given by Dr. Ashmead in his table (Bull. U. S. Nat. Mus., XXIII, 44) and no where else, I leave it in that genus.

Mesostenoideus fulvipes sp. nov.

Black, the face, clypeus, palpi, the eye orbits—the outer more broadly below—a line on the base and apex of the prothorax, a mark on the apex of the middle lobe of mesonotum, scutellum, postscutellum, the keels, the sides of the apical slopes of the metanotum, including the spines and extending on the metapleuræ, tubercles, a large mark, narrowed behind, on the lower part of the mesopleuræ, the greater part of the lower half of metapleuræ—the line distinctly narrowed towards the apex—and brown bands on the apices of all the abdominal segments yellow. Legs rufo-fulvous, the tibiæ and tarsi tinged with yellow, the 4 front coxæ and trochanters yellow. Wings clear hyaline, the stigma and nervures black. ♀. Length 12 mm.; terebra 6 mm.

Face and clypeus sparsely punctured. Mandibles and sides of clypeus (including the foveæ) black. Front at the lower ocellus striated; below it is a short keel. Mesonotum strongly but not closely punctured. Scutellum more sparsely punctured; the basal depression large, deep, with 2 keels in the centre. Base of metanotum smooth, slightly sparsely punctured; behind the keel strongly striated, except on the top of the apical slope; at the base of the keel, in the centre, are 2 short, stout curved keels; the spines stout, rounded and narrowed at the apex. Propleuræ, except at the base, stoutly striated; mesopleuræ less strongly striated above, the lower part punctured; the metapleuræ closely, strongly obliquely striated. Abdomen smooth and shining. Areolet minute, narrowed behind; the recurrent nervure received at its apex; transverse median nervure received distinctly behind the tranverse basal.

Hab.—Mexico.

Cryptanura maculipes sp. nov.

Black; the face, clypeus, mandibles, except at apex, a broad line round the inner and upper eye orbits, a short, broader one on the lower part of the outer, the malar space, palpi, base of pronotum, tegulæ, tubercles, the greater part of the scutellum, the lower half of the mesopleuræ, the mark broadest in front, a large mark, rounded behind, on the upper part of the base of the metapleuræ, a smaller oblique one in the middle and the tubercles, whitish yellow; the apices of the basal 3 abdominal segments yellow, tinged with rufous. Four front femora and tibiæ rufo-testaceous, the coxæ and trochanters pale yellow, the tarsi fuscous; the hind coxæ rufous, marked with black at the base, trochanters black, femora dark rufous, black above; the tibiæ black, with a small white band near the base; the tarsi black, the middle 3 joints white. Wings hyaline, the nervure and stigma black. Pro- and mesothorax smooth, the base of the mesopleuræ closely longitudinally striated. The metanotum behind the keel smooth; the middle transversely striated, the striæ curved; the apical slope longitudinally, irregularly striated, almost reticulated; the tubercles rounded, short, stout. Hind legs, as usual, much longer than the others; the coxæ 3 times longer than thick. Length 6 mm.

Hab.—Mexico.

PHYGADEUONINI.

Oxytænia rufo-lineata sp. nov.

Black; the raised central part of the face, a large mark, roundly dilated in the middle, on the lower inner orbits, clypeus, mandibles, except at apex, malar space, palpi, tegulæ and scutellums yellow; the apices of the abdominal segments narrowly rufo-testaceous; the 4 front legs fulvo-testaceous, their coxæ and trochanters yellow; hind coxæ black; the trochanters and underside of the femora rufous; the tibiæ dark fuscous, the tarsi black; calcaria white. Wings hyaline, the stigma fuscous; the nervures black. ♂. Length fully 6 mm.

Antennæ as long as the body, slender, pilose; the basal joints of flagellum elongate. Clypeus roundly convex, separated from the face by a deep furrow, the sides bounded by a deep oblique one. Apex of clypeus broadly rounded, margined. Head sparsely covered with short silvery pubescence. Thorax shining; the mesonotum sparsely, the pleuræ closely and distinctly punctured. The areola is open at the base, longer than wide, dilated in the middle; the apex with 3 areæ, the central large, the lateral smaller and somewhat triangular. Abdomen smooth and shining, longer than the head and thorax united; the petiole long and slender. Areolet large, 5-angled, it being dilated in the middle behind, where the recurrent nervure is received. Parapsidal furrows deep on the basal slope. Scutellar depression large, deep, an obscure keel in the centre. Metanotal spiracles oval.

Hab.—Mexico.

I only know the ♂ of this species. It fits fairly well the description of *Oxytænia*. The temples are wide; the base of pronotum lined with yellow. Mesopleural furrow deep.

TRYPHONINI.

Scopesis flavolineatus sp. nov.

Black; a mark, roundly dilated above, on the top of the inner eye orbits, oppo-

site the ocelli, a large mark on the face, extending from the top to near the bottom and incised in the centre above, a small mark on the sides below the middle, the clypeus, mandibles, except at the apex, malar space, the scutellums and the 4 front legs lemon-yellow; the apical joint of the hind trochanters, the femora and tibiæ dark rufous; the apices of the joints of the middle tarsi blackish, the anterior so to a less extent. Flagellum of antennæ fuscous below. Wings hyaline, the stigma fuscous, the nervures darker colored. ♂. Length fully 5 mm.

Antennæ clearly longer than the body. Head shining, the front closely punctured, covered with a short pile. Mesonotum punctured in front. Metanotum closely punctured, pilose, the centre shining. Pleuræ closely and distinctly punctured. Abdomen shining, impunctate, pilose; the base of the 1st segment to near the middle, its sides and the apices of the other segments, narrowly, lemon-yellow; the yellow lines on the apical segments dilated in the middle. The disco-cubital nervure is roundly curved; the transverse cubital nervure is long, oblique; the recurrent nervure is received about two-thirds of its length beyond it. Hind tarsi stout, slightly longer than the tibiæ.

Hab.—Mexico.

CERDA gen. nov.

Disco-cubital nervure angled; broken by a stump of a nervure. Areolet oblique, the transverse cubital nervures uniting in front; the recurrent nervure received near the apex; the cubitus angled where it is received. Recurrent nervure broken by a short stump of a nervure above the middle. Tran verse median nervure in hind wings broken below the middle. Median segment with a large areola, longer than broad, of equal width, transverse at the apex; there is a keel on the sides of the base of the metanotum and another below the spiracles; the apical slope bounded above and on the sides by a stout keel; spiracles minute. Abdomen sessile, the sides keeled throughout; the raised central part bounded by stout keels which extend to shortly beyond the middle. The segments are smooth, without depressions or furrows. The segments clearly separated; the apical bluntly rounded, curled downwards. Mandibular teeth of equal length. Clypeus separated from the face; its apex broadly rounded.

Comes near to *Protarchus*, which may be known from it by the metapleuræ having a tooth immediately above the hind coxæ, and by the hind wings having the transverse median nervure broken above, not below, the middle.

Cerda fuscipennis sp. nov.

Rufous, smooth, shining, the ocellar region and the mesopleuræ black. Median segment covered with longish white hair. Apex of mandibles black, their base yellowish. Legs densely covered with short, pale pubescence; the coxæ broadly

black below. Wings dark fuscous, a lighter cloud beyond the areolet, extending from the radius to the discoidal nervure, becoming narrowed gradually. Hind legs much longer than the anterior; their coxæ large, calcaria minute, stout, metatarsus as long as the following 2 joints united. Antennæ 29-jointed. Tegulæ large. ♂. Length 7 mm.

Hab.—Mexico.

OPHIONINÆ.

Limnerium longicauda sp. nov.

Black; the mandibles, palpi and tegulæ yellow; legs fulvous, the coxæ black, the trochanters, a broad band on the centre of the hind tibiæ and the base of the tarsi yellow; the apices of the tarsal joints darker colored; the 4 front tibiæ tinged with yellow; wings hyaline, the nervures fuscous, the areolet small, triangular, the pedicle longer than the lower branches, which are equal in length; the recurrent nervure is received shortly beyond the middle. ♀. Length 4; terebra nearly 3 mm.

Head and thorax smooth, impunctate; the metanotum aciculated; there is a minute petiolar area; the areola is horse-shoe shaped, open at the apex, the keels from it are continued round the sides of the metanotum; there are no lateral areæ. On the apical half of the mesopleuræ in the centre is a deep, slightly oblique, large fovea or depression.

Hab. –Mexico.

The long ovipositor, and there being only one area on the metanotum, distinguishes this species from the other Mexican ones.

Limnerium leptogaster sp. nov.

Black, the head and thorax densely covered with silvery pubescence; mandibles, palpi, antennal scape below, tegulæ, 4 front coxæ and posterior trochanters yellow; the rest of the 4 fore-legs yellowish fulvous; the hind coxæ black; the hind femora rufous, their tibiæ and tarsi black, the tibiæ tinged with testaceous in the middle; wings short, hyaline, the stigma and nervures blackish, areolet small, with a long pedicle; its basal nervure straight, its apical more curved and broken by a bulla below, the recurrent nervure received beyond the middle. ♂. Length 6 mm.

Abdomen long, slender, the basal two joints together as long as the thorax; the 2nd, 3rd and 4th segments marked with testaceous at the apex, especially on the sides. The upper part of the head and the thorax closely punctured. Areola long, obliquely narrowed at the base; there are 2 lateral areæ; the basal is wider than long, obliquely narrowed towards the apex; the apical is longer and is narrowed to a fine point from the inner side at the apex; the posterior median area is wide at the base, where it is not clearly separated from the areola; its apical bounding keels are not so strong as they are at the base. Metasternal keel stout.

Hab.—Mexico.

This species comes near to *L. centrale;* it may be known from it by the much longer abdomen, larger size, by the posterior median area of the metanotum not being of equal width, but having the basal part dilated towards its apex, the rest being also wider above.

The central part of the propleuræ is strongly striated and the upper part of the mesopleuræ less strongly above; in *centrale* these parts are coarsely aciculated, not distinctly striated.

Limnerium mexicanum sp. nov.

Black; the mandibles, palpi, 4 anterior coxæ and trochanters, the hind trochanters, and the tegulæ pale yellow; the rest of the 4 front legs pale fulvous; the hind legs rufous, their coxæ, extreme base of tibiæ, a band beyond the white one near the base, their apical third and the tarsi black; the spurs white; wings hyaline, the nervures and stigma black; the apex of the 2nd abdominal segment and the apical segments at the sides, rufous. ♀. Length 4–5 mm.

Head closely punctured, the sides of the vertex obliquely striated. Labrum clearly separated, yellow. Mandibular teeth piceous. Thorax alutaceous, the pleuræ and metanotum thickly covered with white pubescence. Areola clearly defined, the base roundly narrowed, the sides straight, the apex transverse, the keel not very distinct; from its sides a keel runs obliquely to the apex; the spiracular region bordered by keels. Areolet with a long pedicle, oblique, receiving the recurrent nervure at the apex.

Hab.—Mexico.

Limnerium aztecum sp. nov.

Black; the head and thorax densely covered with white pubescence; the mandibles, palpi, 4 front coxæ and trochanters, the apical joint of the posterior trochanters, the extreme base of the hind tibiæ, a broad band (broader than the apical or basal parts) in the centre, the basal third of the metatarsus and the calcaria whitish yellow; wings hyaline, the stigma fuscous, the nervures darker; the areolet small, triangular, shortly appendiculated. Head and thorax alutaceous, the pleuræ smoother and more shining. Areola indistinctly defined, small; the curved transverse furrow at its apex, stout in the middle, more indistinct laterally. Tegulæ yellow. Abdomen stout, especially posteriorly; not much longer than the head and thorax united. Ovipositor short. Length 4–5 mm.

Hab.—Mexico.

May be known from the other Central American species by the broad white band on the hind tibiæ.

Limnerium centrale sp. nov.

Black; the head and thorax densely covered with silvery pubescence; the abdomen with shorter white pubescence; the underside of the antennal scape, mandibles (their apex piceous) and tegulæ yellow; legs: the 4 anterior rufo-fulvous, their coxæ and trochanters pale yellow; the hind legs rufous, the coxæ black, trochanters yellow; the apex of femora slightly, of the tibiæ more broadly and the tarsi black; wings hyaline, the stigma and nervures fuscous; the antennæ dark fuscous, the scape yellow below. ♂. Length 5.5 mm.

Metanotal areola not defined; in the centre are 2 keels running from the base to the apex; at their side, at the base, is an area which is obliquely narrowed on the outerside from the apex to the base; beyond it are 2 areæ, the apical shorter, broader and somewhat triangular; the spiracular area defined. The apex of the

2nd abdominal segment testaceous, the others pale testaceous at the apex. Areolet with the petiole as long as the basal branch of the transverse cubital nervure; the recurrent nervure received in the middle.

Hab.—Mexico.

Campoplex sumichrasti sp. nov.

Black; the head and thorax densely covered with white pubescence; the greater part of the 1st and more or less of the sides of the other abdominal segments ferruginous; legs black, the 4 anterior tibiæ and tarsi, the fore femora, except behind, the apex of the middle, the middle of the posterior tibiæ behind, the 4 front calcaria, the mandibles broadly at the base and the palpi yellow; wings hyaline, the apical half of the radial cellule smoky, the stigma fuscous, the nervures black; areolet large, shortly appendiculated, angularly dilated below, the 1st transverse cubital nervure straight, the 2nd roundly curved, the recurrent nervure received in the middle. ♀. Length 15 mm.

Face and clypeus closely, finely longitudinally reticulated; the hair long and thick; the front and vertex coarsely alutaceous, the former with a furrow down the centre. Pro and mesonotum closely rugosely punctured; their pleuræ more shining and with the punctures clearly separated. The scutellum more rugosely punctured than the mesonotum. Metanotum closely transversely, finely striated, the striæ roundly curved; the apical slope depressed in the middle; the sides near the stigma tuberculate; the segment is more densely haired than the rest of the thorax.

Hab.—Mexico.

Allied to *C. tepanecus* Cr.

PIMPLINA.

Epiurus flavipes sp. nov.

Black, the pro- and mesothorax with the scutellum, the lower part of the metapleuræ and the hind coxæ, rufous; the sides of the abdomen tinged with brown; legs clear pale yellow; basal half of flagellum fuscous below; palpi pale yellow; wings clear hyaline, the stigma fuscous, the nervures black. ♀. Length 7; terebra 4.5 mm.

Head and thorax smooth and shining; the propleuræ for the greater part black. The depression on the 1st abdominal segment is bordered by a distinct keel; the depressions on the 2nd to 5th segments are punctured; the sheaths of the ovipositor broad, densely covered with longish black hair. Areolet almost triangular; the recurrent nervure received at its apex. Transverse median nervure in hind wings broken shortly below the middle.

Hab.—Mexico.

PAIPILA gen. nov.

Wings without an areolet, the transverse cubital nervure very short, the radius and cubitus almost touching; the recurrent nervure is received considerably behind it; transverse median nervure interstitial; cubitus in hind wings unbroken. Stigma linear; the basal abcissa of radius curved, the apical straight. Both wings are cilia-

ted, the ciliæ much longer than usual. Face rostriform, narrowed below; the malar space is as long as the antennal scape; on its innerside is an indistinct furrow. Apex of clypeus broadly rounded. Occiput margined. Middle of metanotum depressed, the depression bordered by keels; the apical slope oblique, bordered by a keel, as is also the stigmal region and the metasternum. Stigma small, oval. Abdominal petiole slender, curved, hardly dilated at the apex; the stigma placed in the middle. The abdomen as in *Limnerium*, dilated towards the apex; the ovipositor short, hardly projecting. Legs long and slender, especially the hinder, which have their coxæ about 3 times longer than thick; the tibiæ as long as the femora and trochanters united; the calcaria minute, as long as the 4th tarsal joint, the metatarsus as long as the following 3 joints united; the apex of femora reaches near to the apex of the abdomen.

The systematic position of this genus is not very clear to me. It looks like a small *Limnerium*, but it cannot very well be placed in the Ophioninæ. It has the neuration of the front wings as in the Acœnitini, but it differs from that group in the form of the abdomen and in the long slender legs. It might be referred to the Labenini from the long hind coxæ, but otherwise there is not much resemblance. The form of the mouth separates it from the *Xorides*. The structure of the 1st abdominal segment is different from what it is in any of the tribes of the Pimplinæ, being much more similar to the abdomen of the Campoplegini. What ever its relationship may be it should be readily known by the rostiform head, furrowed malar space, depressed middle of the median segment, long slender petiole, with the stigma in its middle, short, almost obsolete transverse cubital nervure, long hind coxæ, the middle coxæ being also elongate, and unbroken transverse cubital nervure in hind wings.

Paipila longipes sp. nov.

Black; the 4 front legs testaceous, the middle femora and tibiæ infuscated; the clypeus at the apex, mandibles and palpi rufo-testaceous; tegulæ yellow; middle and base of abdomen testaceous, the apex of the basal 3 segments of the abdomen narrowly obscure yellow; wings hyaline, the nervures black, the stigma fuscous. ♀. Length nearly 5 mm.

Antennæ as long as the abdomen, which is more than double the length of the thorax; densely covered with a short pile. Head and thorax closely minutely punctured; there is a raised, more shining line down the face. Abdomen smooth and shining; the 1st segment has a furrow in the centre above; it is as long as the 2nd and 3rd united. Hind coxæ closely distinctly punctured.

Hab.—Mexico.

BRACONIDÆ.

SIGALPHINÆ.

RHYSSOSIGALPHUS gen. nov.

♀.—Abdomen with one visible segment; its apex deeply roundly incised, the sides of the incision forming longish, stout teeth; the back coarsely, rugosely punctured. Radial cellule short, acute at the apex. Transverse median nervure received clearly beyond the transverse basal; it does not extend to the apex of the wing, so that the pobrachial and the podiscoidal cellules are not separated, the anal nervure is only indicated at the base, it is interstitial; the podiscoidal and the anal cellules are not separated; there is a distinct axillary transverse nervure in the axillary cellule. In the hind wing the radius is almost obsolete; the cubitus extends to the middle; there is a large pobrachial cellule, wide at the apex, where it is closed by a stout, slightly oblique nervure, it is bounded below by a nervure which curves roundly upwards and reaches to the transverse nervure; the radius and cubitus are indistinct; the other nervures stout. Malar space large. Mesonotum trilobate; apex of clypeus slightly waved. Antennæ placed high up on the face. Metanotum areolated, its apex with a steep slope bordered above. Abdomen sessile, margined at the base.

Comes nearest to *Urosigalphus* Ashm., which may be known from it by having the "apex of abdomen *without* or with only a slight emargination," not deeply emarginated and stoutly spined as in the present genus. The ovipositor issues from the middle of the abdomen; the hypopygium is depressed in the middle, the apex bifoveate; the sides raised, the raised part continued onto the teeth.

Rhyssosigalphus rugosus sp. nov.

Black, the fore legs and the apex of middle femora and their tibiæ rufotestaceous; wings fusco-hyaline, the nervures and stigma black. ♀. Length 4 mm.

Head rugosely, but not closely punctured, thickly covered with glistening white hair; the clypeus, a line in the centre of the face and the vertex behind the ocelli smooth. Thorax coarsely, irregularly rugosely punctured and reticulated; the greater part of the mesopleuræ smooth and shining. Middle lobe of mesonotum clearly separated, bounded by a keel, not reaching to the scutellar depression, which is large, smooth and deep. Metanotum depressed at the base, its centre with a deep, square area, bounded by stout keels; the lateral region is divided into two by a transverse keel; the parts between irregularly depressed; the apical slope is irregularly reticulated and margined above by a stout keel; the base and apex of the mesopleuræ and the base of metapleuræ with a row of deep round foveæ; the mesosternum closely reticulated. Abdomen closely,

stoutly punctured; on the back the punctures run into reticulations and they become weaker towards the apex; the apex in the middle transverse, the sides forming stout teeth, which are twice longer than wide.

Hab.—Mexico.

Urogaster albinervis sp. nov.

Black, the apex of the 4 front femora broadly, their tibiæ and tarsi, the base of the hind tibiæ and the apical 4 joints of the hind tarsi testaceous; the wings very clear hyaline, iridescent; the costa and borders of the stigma testaceous, the other nervures milk-white, almost transparent. Head and thorax opaque, the mesonotum closely, minutely punctured, the scutellum more shining, almost impunctate; the basal depression with some striæ; its sides bordered by a distinct transversely striated furrow; the apex smooth and with a distinct fovea; the part outside the furrow is smooth and shining and bordered at the base by striated furrow. The postscutellum is comparatively large, striated, depressed, bordered by a stout keel which is rounded behind. In the centre of the metanotum is a large area which is angularly dilated in the middle and is irregularly rugose; the sides are keeled; the lateral parts stoutly aciculated; the centre of the middle area is aciculated. Tegulæ dark testaceous. The body and legs are covered with a minute pale pile. Length 2 mm.

Hab.—Mexico.

Chelonus clavinervis sp. nov.

Black; the apical three-fourths of the fore femora, the apex of the 4 posterior and the tibiæ and tarsi rufo-testaceous; the base of the abdomen with a large mark, about 3 times longer than wide on the sides, with a smaller mark, half its width, attached to its outer side, of a whitish testaceous color; wings hyaline, the apex smoky, the nervures and stigma black. ♀. Length 4 mm.

Clypeus margined laterally, smooth and shining; its basal depression with some stout keels. In the centre of the base of the metanotum are 2 twisted keels, with a broken one, stout at the base, in the centre; on the sides are some irregular keels; the apical slope is stoutly, irregularly longitudinally striated. Propleuræ coarsely rugose; the mesopleuræ strongly punctured, the punctures running into reticulations; the metapleuræ coarsely closely rugose-reticulated. Abdomen closely punctured, reticulated, the base much more strongly than the rest and irregularly striated. The base of the radius is thickened; the apex of the transverse basal nervure is clavate, black, the rest of it and the basal 2 nervures are testaceous, the other nervures black.

Hab.—Mexico.

Euphoriella testaceipes sp. nov.

Dark rufous, the flagellum of antennæ black, the legs yellowish testaceous; wings hyaline, the nervures and stigma dark testaceous. ♀. Length 2 mm.

Antennæ at least 15-jointed, longer than the body, almost bare, the joints greatly lengthened. Smooth, shining, almost bare; the parapsidal furrows deep, distinct on the basal half of mesonotum. A distinct transverse furrow at the base of the scutellum. Ovipositor projecting, about one-third of the length of the abdomen. Pterostigma large, elongate. Radius obsolete. Basal nervure

received at the base of parastigma; the transverse median shortly before the middle of the cellule; cubitus obsolete beyond the 1st transverse cubital nervure. The only complete cellules are the 1st cubital and the 1st discoidal; the transverse median nervure is thickened and only present in front, the submedian and the 2nd discoidal cellules being thus not completely separated. Apex of wings ciliated.

Hab.—Mexico.

OXYURA.

Zelotypa xanthopus sp. nov.

Black, smooth and shining, the head, thorax and petiole covered with glistening white hair; the mandibles and basal two joints of antennæ rufous; the legs rufo-testaceous, tinged with yellow; wings hyaline, the nervures dark testaceous. ♀. Length 2.5 mm.

Flagellum of antennæ covered with a white pile; its first joint fully twice the length of the pedicle, the 1st to 9th distinctly longer than broad, the others not much longer than broad. Angles of collar rounded. Metanotum stoutly keeled in the middle; the sides bordered by thinner keels. Petiole about 3 times longer than wide, stoutly keeled down the centre and with 2 thinner keels on either side. Marginal vein not half the length of marginal cellule and twice the length of the 1st abcissa of radius. Tegulæ rufo-testaceous. Abdomen not much longer than the head and thorax united, sharply pointed at the apex and to a less extent at the base of the 2nd segment.

Hab.—Mexico.

Epyris varidens sp. nov.

Black, densely covered with white pubescence, wings hyaline, the nervures whitish testaceous. ♂. Length 7–8 mm.

Antennæ as long as the thorax and abdomen united, the joints of flagellum clearly separated, densely covered with white pubescence. Head strongly rugosely punctured; the punctures more widely separated and smaller on the vertex than on the front, where they run into each other. The keel on the clypeus is dilated and opaque at the apex, which is slightly roundly incised. Mandibles large, curved; their basal tooth is larger than the others, red, triangular, and does not point, like the others, towards the apex; the middle pair are the shortest and bluntly rounded; the apical is long, stout and becomes gradually narrowed to the apex. The mandibles are strongly punctured, the punctures elongate and clearly separated; the outer edge is fringed with long white hair. Pronotum strongly punctured, the punctures round and clearly separated; the mesonotum is more sparsely and less strongly punctured, and the scutellum still more weakly. Metanotum with a stout keel down the middle; this is weaker at the base where two keels run into it from the sides; the area thus formed is stoutly striated, the 2 inner keels being stouter and widely separated from the thin central keel; the apical portion of this is closely bordered by striæ, which become gradually narrowed; the sides above and the apical slope above are irregularly rugose and thickly covered with white hair. Central depression of propleuræ irregularly striated; the raised lower part with a deep oblique furrow beyond the middle. On the basal half of the mesopleuræ is an irregular longitudinal furrow, wide, shallow and striated at the base, narrowed beyond the middle, its apex deep,

ovoid, irregularly rugose in the middle; below its middle is a deep fovea, rounded above, transverse below. Metapleuræ finely, closely striated.

Hab.—Mexico.

Epyris mexicanus sp. nov.

Black; the antennæ, except the apical joints which are infuscated, mandibles except the teeth, which are black, and the legs rufo-testaceous; the coxæ, the fore femora broadly in the centre behind and the greater part of the 4 posterior black; the sides and apex of the 1st abdominal segment and the apices of the others testaceous. Wings hyaline, the nervures testaceous. ♂. Length 5 mm.

Head strongly but not closely punctured. Clypeus broadly rounded, bluntly keeled in the middle. Flagellum of antennæ densely covered with white pubescence. Pro- and mesonotum sparsely, distinctly punctured, the metanotum shining, impunctate, except on the apical slope, which is aciculated. The centre of the propleuræ closely, strongly striated. There is an irregular striated depression on the base of the mesopleuræ, beyond this is a roundly curved, horn-shaped depression, dilated at the apex. Metapleuræ aciculated. Sternum thickly covered with long white hair. Tegulæ testaceous.

Hab.—Mexico.

ACULEATA.

Rhopalum spinigerus sp. nov.

Black; antennal scape, 4 front legs, a large mark, broadly rounded below the tubercles, hind trochanters and a line on the posterior tibiæ behind, mandibles, except at the apex and palpi, bright lemon-yellow; flagellum of antennæ fuscous below; wings hyaline, the nervures and stigma black. ♂. Length nearly 4 mm.

Lower part of front, face and clypeus thickly covered with silvery pubescence. Eyes large, coarsely facetted, distinctly converging below. Ocelli in a triangle, the hinder separated from each other by about the same distance they are from the eyes. Temples above as long as the antennal scape. Metanotal area with a large, deep V-shaped depression which reaches to its middle; there is a deeper, larger depression on the apical slope; there are some short keels on the base. Pleuræ smooth, thickly covered with white pubescence. Petiole in length twice the width at the apex, becoming gradually wider towards it; it is clearly longer than the 2nd segment. Tegulæ piceous. Recurrent nervure received almost in the middle of the cellule; apical abscissa of radius straight, oblique. Fore femora narrowed at the base and to a less extent at the apex; on the under side, at the base of the apical third, is a sharp tooth or spine; the tibiæ narrowed at the base, from where it becomes gradually thicker to the apex; the basal joint of the tarsi dilated, rounded above, straight below. Middle legs normal. The hind tibiæ become gradually thicker, but not very much, towards the apex. Outer spur of hind tibiæ broad, knife-shaped; metatarsus stout, as long as the other joints united.

Hab.—Mexico.

Rhopalum angulicolle sp. nov.

Black; antennal scape below, mandibles, except at the apex, palpi, tubercles, the greater part of the fore tibiæ and tarsi and the middle tarsi, the middle tibiæ

behind and the base of the hinder, yellow; wings hyaline, the nervures and stigma black; the apices of the abdominal segments piceous. ♀. Length 5 mm.

Head large, cubital, longer than broad, the temples very little narrowed, as long as the eyes as seen from above; the occiput roundly incised, the outer edges bluntly rounded. Ocelli in a triangle, separated from the eyes by a greater distance than they are from each other; there is a furrow between them, which, behind, extends beyond the hinder. The lower part of the outer orbits is obliquely narrowed. Pronotum large, flat above, not much narrowed towards the base, the basal angles slightly projecting, rounded. There are 2 fine furrows on the base of the mesonotum in the centre. Scutellar depression deep, wider and deeper at the sides; its apex bordered by a distinct, curved furrow. Metanotum aciculated, its base with a striated depression; the furrow bordering the area is also striated; the apical furrow deep, narrow above and below. Abdominal petiole long and slender, not much dilated at the apex, fully as long as the following two segments united. Hind tibiæ narrowed at the base, greatly dilated towards the apex, which is rounded; metatarsus as long as the following 3 joints united. Recurrent nervure received shortly beyond the middle; the apical abcissa of radius long, oblique.

Hab.—Mexico.

HOLCORHOPALUM gen. nov.

Mesosternum bordered by a wide, deep, oblique furrow. Base of metanotum with 3 large areæ, the central smaller than the lateral; the top of apical slope bordered by a keel. Occiput bordered by a stout keel placed far below the top. Mandibles long, curved, sharply pointed. Parapsidal furrows distinct. Radial cellule short, not reaching half way to the apex; transverse median nervure received far behind the transverse basal.

Temples short, obliquely narrowed. Ocelli in a triangle. Scutellar depression large, deep, a stout keel in its centre and an oblique one on either side. Abdominal petiole long, nodose at the apex. Legs densely covered with long hair; claws long, slender, simple. Mesopleuræ bordered near the base by a stout, obliquely curved keel. Third and fourth joints of antennæ about equal in length.

This genus has the form and long abdominal petiole of *Rhopalum*, but is readily distinguished from it by the conspicuous mesopleural furrow, by the areolated base of mesonotum and by the transverse median nervure being widely distant from the transverse basal.

Holcorhopalum foveatum sp. nov.

Black, shining; the legs pallid yellow, the hind femora black, the hind tibiæ, except at the base, and their tarsi dark fuscous; wings hyaline, the nervures blackish; apex of 1st abdominal segment testaceous, the last and the apex of penultimate rufous Antennal scape and underside of flagellum rufo-testaceous. ♀. Length 4 mm.

Head and thorax sparsely covered with longish blackish hair and more sparsely with longish silvery pubescence; the clypeus more densely than the rest. Its apex is testaceous and is broadly rounded. Basal two-thirds of mandibles testaceous, the apical black. The basal half of the pronotum is depressed, the apical being clearly raised above it; it is bordered all round with testaceous. Tubercles large, flat, testaceous, the sides and apex bordered with silvery pubescence. Mesopleuræ roundly bulging out; a large, round fovea in the centre. Post-scutellum bordered by keels, the part on either side densely covered with silvery pubescence. Apical slope of metanotum closely, transversely striated; there is a large curved fovea on the upper part of the metapleuræ. The mesopleural furrow bears in the middle some stout striæ. Abdominal petiole as long as the 2nd and the half of the 3rd segment.

Hab.—Mexico.

Crabro mexicanus sp. nov.

Black; the mandibles broadly at the base, the greater part of the antennal scape, the lateral third of the apex of the pronotum, the scutellar keels, a curved line on either side of the apex of post-scutellum, a line on the propleuræ, united to the line on the pronotum, joined to the yellow tubercles and continued down the apex of the propleuræ, yellow; the fore femora (except a black band behind) tibiæ and tarsi, a line on the underside of the middle femora at the apex, the 4 hind knees, the basal half of the posterior tibiæ behind and the greater part of the hind tarsi, yellow. Flagellum of antennæ brownish beneath. Wings hyaline, the nervures black. ♂. Length 5 mm.

Face and clypeus densely covered with silvery pubescence; the middle of clypeus bearing 4 short, obtuse teeth, the outer sharper and narrower than the inner. Vertex and front above shagreened; the frontal depression bordered above by a keel; a distinct, deep furrow runs to it from the ocelli. The upper part of the eyes is bordered by a furrow, which is obscurely crenulated on the outer side. Occiput acutely margined. Mesonotum closely, minutely punctured; its centre at the base is depressed and there is a shallow furrow on either side of the depression; on the outer side of these, at the extreme base, is a row of 4 or 5 foveæ. Hinder edge of scutellum obscurely striated; a stout keel in the centre of the basal depression. Metanotal area bounded by a keel, which is bordered by a furrow on the inner side; in the centre are 2 keels, which converge slightly towards the apex; on either side of these, at the base, is a curved keel, forming a semi-circular area; the apical slope has the central depression obscurely transversely striated. Mesopleuræ densely covered with silvery pubescence; on the top, at the base, are 4 stout keels; the furrow bordering these bears some stout keels and reaches close to the sternum; the apical furrow is crenulated. Metapleuræ with a line of foveæ near the base and another bordering the apex. First abdominal segment broad at the base, becoming gradually wider towards the apex; it is longer than the 2nd segment. Hind tibiæ with 4 obtuse teeth, the central pair the larger. Apical abcissa of radius straight, not oblique; recurrent nervure received in the middle of the cellule.

Hab.—Mexico.

Comes near to *C. yucatanensis* and *C. montezuma*. The ocelli are in a curve; the occiput roundly incised.

Crabro ezræ sp. nov.

Black; the antennal scape below, the greater part of the 4 front trochanters, apex of fore femora, the tarsi, the 4 front tibiæ and the base of the posterior tibiæ, yellow. Mandibles yellow, rufous at the apex. Wings hyaline, the nervures black; the recurrent nervure received shortly, but distinctly, before the middle of the cellule; the apical abscissa of radius oblique, rounded below. ♀. Length 5 mm.

Face and clypeus densely covered with silvery pubescence; clypeus keeled in the centre, its apex rounded. Eyes very large, coarsely facetted; distinctly converging below. Ocelli large; the anterior separated from the posterior by a slightly greater distance than these from each other. Temples large. Occiput transverse. Pro- and mesothorax alutaceous; the median segment shining; its area large; the bounding furrows curved, obscurely striated; the central furrow is obscurely crenulated. Pleuræ smooth and shining. Tegulæ piceous. Petiole broad at the base, becoming gradually wider towards the apex.

Hab.—Mexico.

In size and coloration this species comes close to *C. montezuma*, but may readily be separated from it by the ocelli not being in a triangle but in a curve, and the metanotal area not longitudinally striated.

Entomognathus mexicanus sp. nov.

Black, smooth, shining, covered with silvery pubescence; the outer edge of the pronotum, the 4 front tibiæ, except behind, and the tarsi, except at the apex, yellow; wings hyaline, the nervures black. Face and clypeus densely covered with silvery pubescence. Metanotal area roundly raised, clearly separated, strongly aciculated, with 4, not very distinct, longitudinal keels; the keels bounding it are continued down the centre, forming an area, which is narrowed gradually towards the apex; the rest is coarsely aciculated and is bordered laterally. The oblique furrow near the base of the mesopleuræ is wide, deep and bears stout keels. Radial cellule short, not quite reaching to the middle; the apical abscissa slightly oblique, more than half the length of the transverse cubital. Abdomen smooth, shining; the apices of the 3rd and 4th segments roundly incised; the penultimate segment closely, coarsely punctured; the last rufous; the dorsum with the sides stoutly raised all around, the apex rounded; the edges of the segments piceous. Clypeus roundly convex; its apex not quite transverse, the outer edges slightly dilated; beyond it are two indistinct, rounded teeth or tubercles. Hinder ocelli separated from each other by a slightly greater distance than they are from the eyes and by a distinctly greater distance than they are from the anterior. The pubescence on the eyes is white. Length 3 mm.

Hab.—Mexico.

Entomognathus appears to be rare in the nearctic and neotropical regions.

PLESIOMASARIS gen. nov.

♂.—Fore wings with 3 cubital cellules, the 2nd and 3rd receiving each a recurrent nervure, the radial cellule appendiculate. Head large, transverse behind; temples distinct; malar space obso-

lete. Apex of clypeus bidentate. Antennæ stout, clavate, as long as the thorax. Abdomen stout, almost sessile, becoming gradually wider to the apex, as long as the 2nd segment. Antennal scape stout, short, about 3 times longer than wide, not longer than the 3rd joint.

The scutellum is large, flat, rounded behind; metanotum short, with a straight oblique slope; the last abdominal segment bluntly rounded; the ventral surface flat. Legs moderately stout, the tarsi longer than the tibiæ. Eyes large, slightly converging below. Head wider than the thorax. Tegulæ large.

May be known from *Paramasaris* by the sessile abdomen; from *Euparagia* by the antennæ in ♂ being clavate and the scape short, not very long. The body largely marked with yellow as in *Odynerus*, to which it has a great resemblance.

Plesiomasaris maculiceps sp. nov.

Black; a large oval mark, longer than broad, in the centre of the clypeus above, a small mark on the vertex touching the end of the eyes, a line on the upper edge of the pronotum, large, roundly dilated at the base, the greater part of the tegulæ, a spot below the tubercles, a large mark on the apical half of the scutellum, its sides at the base largely, its centre slightly dilated, a line on the apex of the 1st abdominal segment, squarely dilated at the sides, a similar line on the 2nd to 5th roundly dilated laterally, and a line in the centre of the 6th, yellow. Legs black, the knees, the greater part of the 4 hinder tibiæ and the basal joint of the tarsi, yellow. Wings hyaline, the nervures black; the 1st recurrent nervure received shortly beyond, the 2nd shortly in front of the middle of the cellule; 1st transverse cubital nervure oblique, the 3rd broadly rounded. The whole body and legs densely covered with silvery pubescence. Head and thorax alutaceous, the pleuræ closely punctured; the metathorax less closely punctured and with a curved furrow behind the middle on the lower two-thirds; the upper part at the base bears some stout irregular striæ. Clypeal teeth long, stout, narrowed towards the apex, which is smooth, the rest being punctured. Base of mandibles punctured, the middle rufous; both the teeth are bluntly rounded. The outer eye orbits are clearly margined. Length 8 mm.

Hab.—Mexico.

A Contribution to the Study of American DOLICHOPODIDÆ.

BY J. M. ALDRICH.

TABLE OF GENERA.

1. Fourth longitudinal vein with a widely divergent fork on the front side...2.
   Fourth longitudinal vein generally without fork; if one is present it is nearly parallel with the main vein.....4.
2. Cilia of tegulæ black, third vein converging to the fourth at tip, scutellum with four large bristles.....**Psilopodinus** Bigot.
   Cilia of tegulæ pale, third vein parallel with fourth at tip, scutellum with two large and usually two small bristles.....3.
3. Face wide, vertex deeply excavated .....**Agonosoma** Guérin.
   Face narrow, vertex scarcely excavated.....**Leptorhethum** Aldrich.
4. Thorax almost as broad as long; head wider than its own height or than the thorax, face very wide, vertex deeply excavated.
   Mesorhaga Schiner.
   Head and thorax not as described.....5.
5. Fourth vein bent forward, forming an apical cross-vein; posterior cross-vein oblique, parallel with the margin of the wing.
   Plagioneurus Loew.
   Posterior cross-vein nearly transverse, usually no apical cross-vein.....3.
6. Hind metatarsi with large bristles above ... .**Dolichopus** Latreille.
   Hind metatarsi without large bristle above .....7.
7. Hypopygium long, extending forward under the venter.....8.
   Hypopygium short, not extending forward under the venter.....20.
8. Arista plumose .....9.
   Arista bare or pubescent .....11.
9. Face wide, bulging on the lower part.....**Pelastoneurus** Loew.
   Face narrow.....10.
10. Third antennal joint of male large, elongate, excavated above
    Leptocorypha Aldrich.
    Third antennal joint short, normal ....**Sarcionus** Aldrich.
11. Before the scutellum the posterior third of the dorsum is hollowed out, or at least distinctly flattened .....12.
    Before the scutellum convex as usual .....15.
12. Posterior cross-vein distant, much more than its own length from the margin of the wing (measured on the fifth vein).....13.
    Posterior cross-vein distant about its own length from margin .....14.
13. Second antennal joint prolonged along the inner side of the third.
    Cœloglutus Aldrich.
    Second antennal joint not so prolonged, or forming a cup for the third.
    Thrypticus Gerstaecker.
14. Third and fourth veins parallel towards the tip; maritime species.
    Aphrosylus Walker.
    Third and fourth veins convergent; found on bark of trees.
    Medeterus Fischer.

15. The face of the male extends below the eyes, hanging down before the mouth, apron like ..... **Polymedon** Osten Sacken.
The face of the male reaches about as far as the lower edge of the eyes; head vertically enlongated ..... **Tachytrechus** Stannius.
Face of the male reaching as far as the lower edge of the eyes, but the head not elongated ..... **Paraclius** Loew.
16. Third and fourth veins parallel towards the tip * ..... 17.
Third and fourth veins distinctly convergent ..... 19.
17. Bristles of thorax yellow ..... **Thrypticus** Gerstaecker.
Bristles of thorax black ..... 18.
18. First antennal joint bare above ..... **Peloropeodes** Wheeler.
First antennal joint hairy above ..... **Gymnopternus** Loew.
19. The last segment of the fourth vein gradually approaching the third. **Hercostomus** Loew.
Last segment in the middle abruptly curving forward, then gradually resuming its former course, ending near the third vein. **Paraclius** Loew.
20. Costal vein extending only to the tip of the third vein, the latter part of the fourth vein evanescent ..... **Asyndetus** Loew.
Costal and fourth veins normal ..... 21.
21. First antennal joint hairy above ..... 22.
First antennal joint bare above ..... 26.
22. Fourth vein towards the tip strongly curved towards the the third, nearly reaching it in the margin ..... **Pelastoneurus** Loew.
Fourth vein parallel with the third, or slightly convergent ..... 23.
23. Arista dorsal, face very narrow, palpi small ..... **Anepsius** Loew.
Arista dorsal, face wide, palpi large ..... 24.
Arista nearly or quite at the tip of the large, pointed third joint ..... 25.
24. Arista plumose ..... **Phylarchus** Aldrich.
Arista pubescent ..... **Diostracus** Loew.
25. Proterior cross-vein distant about its own length from the end of the fifth vein ..... **Hypocharassus** Mik.
Posterior cross-vein much more than its own length from tip of fifth vein. **Argyra** Macquart.
26. A concave or distinctly flattened, bare space before the scutellum ..... 27.
Thoracic dorsum convex as usual ..... 31.
27. Bristles of thorax pale yellow ..... **Chrysotimus** Loew.
Bristles black, rarely brownish ..... 28.
28. Fourth vein parallel with the third beyond the cross-vein, or nearly so. 29.
Fourth vein converging towards the third, either gradually or by a double curve ..... **Neurigona** Rondani.
29. Acrostichal bristles present only at the anterior edge of thorax, very minute ..... **Xanthochlorus** Loew.
Acrostichal bristles well developed, two-rowed ..... 30.
30. Very minute, blackish, opaque species ..... **Achalcus** Loew.
Small, yellow species ..... **Xanthina** Aldrich.

* *Thrypticus minor* Ald. from St. Vincent, W. I., has the 3rd and 4th veins somewhat convergent.

31. Wings elongate, the posterior cross-vein beyond the middle, less than its length from tip of fifth vein (Hydrophorinæ).....32.
Wings not elongate, posterior cross-vein scarcely beyond the middle, more than its length from end of fifth vein (if less, the hind metatarsus shorter than the following joint.....34.
32. Fore femora slender.....**Liancalus** Loew.
Fore femora thickened, with spines below.....33.
33. Spines of fore femora very short, thoracic dorsum without well-marked pollinose lines.....**Hydrophorus** Fallén.
Spines of fore femora long, dorsum with pollinose lines...**Scellus** Loew.
34. Outer appendages of the hypopygium filiform; arista dorsal.
Nematoproctus Loew.
Not with both characters.....35.
35. Second joint of antenna with a thumb-like projection along the inner side of the third.....36.
Not with such projection.....37.
36. Face of female wide, the lower part projecting, roof-like.
Syntormon Loew.
Face of female not so constructed.....**Parasyntormon** Wheeler.
37. Eyes of male contiguous or nearly so below the antennæ.....38.
Eyes of male contiguous or nearly so above the antennæ.
Diaphorus Meig., pt.
Eyes closest together at the level of the antennæ; middle legs of male distorted or with peculiar structure.....**Campsicnemus** Walker.
Eyes of male not contiguous nor closely approximated.....39.
38. Pulvilli of male fore tarsi conspicuously enlarged.....**Eutarsus** Loew.
Pulvilli not enlarged.....**Chrysotus** Meigen, pt.
39. Thorax bright green, abdomen yellow, with a good deal of silvery pollen.
Leucostola Loew.
Not so marked.....40.
40. Face broad, the palpi large, reposing on the proboscis; pollinose species.
Thinophilus Wahlberg.
Palpi of ordinary size or else projecting lamelliform, free from the proboscis.....41.
41. Third joint of the antenna in the male conspicuously long, awl-shaped, not much wider at base than the first joint...**Rhaphium** Meigen.
Third joint long, lancet-shaped, wider than first joint.
Porphyrops Meig.
Third join short, the tip sometimes drawn out into a point.....42.
42. Abdomen of male with four blunt bristles at the tip.
Diaphorus Meig.
Abdomen destitute of these bristles.....43.
43. Arista nearly or quite apical.....**Chrysotus** Meigen, pt.
Arista dorsal.....44.
44. Costa thickened near the apex of the first vein; hind cross-vein at right angles to the costa.....**Teuchophorus** Loew.
Costa not thickened; cross-vein slanting more or less towards the tip of the wing.....45.

45. First joint of fore tarsus shortened in the male.
Nothosympycnus Wheeler.
First joint longer than the following ..... **Sympcnus** Loew.

Since I prepared the table of genera of this family for Dr. Williston's Manual, many changes in the genera have occurred. The following notes explain these:

Of those omitted in this table:

Psilopus goes in *Psilopodinus; Guamptopsilopus* in *Agonosoma.*
Hygroceleuthus falls into *Dolichopus.*
Aptorthus is a synonym of *Mesorhaga.*
Pœcilobothrus does not occur in North America, the species being herein assigned to *Sarcionus.*
Metapelastoneurus falls into *Pelastoneurus.*
Aphantotimus is a synonym of *Thrypticus.*
Dactylomyia falls into *Neurigona.*
Macellocerus falls into *Tachytrechus.*
Lasiargyra falls into *Argyra.*
Lyroneurus falls into *Diaphorus.*

Of added genera:

Aphrosylus and *Teuchophorus* are European genera found to occur here.
Celoglutus was overlooked before.
Parasyntormon and *Nothosympycnus* are new genera by Wheeler.
Sarcionus, Phylarchus and *Xanthina* are new genera by myself.

Of recent genera not included:

Xiphandrium, assigned to our fauna by Wheeler, does not really occur in North America.
Drepanomyia is a synonym of *Hypocharassus.*
Parhydrophorus falls into *Hydrophorus.*
Xanthotricha is a synonym of *Thrypticus.*
Synarthrus, revived by Wheeler, has been rejected by Mik, in favor of *Syntormon.*

The bibliographical references will be given in full in my forthcoming Catalogue of North American Diptera.

PELASTONEURUS, PARACLIUS and SARCIONUS.

These three genera are in some cases difficult to distinguish from each other; briefly, *Pelastoneurus* and *Sarcionus* have a plumose arista, while that of *Paraclius* is hardly pubescent; the face in

Pelastoneurus is wide and bulges below, while in *Sarcionus* it is narrow and does not bulge.

To avoid mistakes of generic reference, I have combined the tables of the three genera.

Combination Table of North American Species.

1. Femora largely black ..... 2.
   Femora yellow, or but little infuscated ..... 10.
2. First part of costa greatly thickened in the male, noticeably so in the female ..... 3.
   First part of costa not perceptibly thickened ..... 4.
3. Tibiæ yellow (W. I.) ..... **Paraclius abdominalis** Aldrich.
   Tibiæ black (La., N. Y., Cuba, Mex.) .. **Paraclius albonotatus** Loew.
4. Fore femora yellow, middle and hind ones with the apical third and half respectively black (Mex.) ..... **Paraclius femoratus** Aldrich.
   Fore femora black, with yellow tips; middle black, with apical half yellow; hind ones yellow, with black tips (Cal.).
   Pelastoneurus dissimilipes Wheeler.
   Femora, at least of male, more uniformly black ..... 5.
5. Antennæ reddish, except the upper edge and tip; thoracic dorsum bright bluish green (W. I.) ..... **Paraclius fuscicornis** Aldrich.
   Antennæ black ..... 6.
6. Tibiæ of male wholly black ..... 7.
   Tibiæ of male largely yellow ..... 8.
7. Upper half of the face bright green (Mex.).
   Pelastoneurus hamatus Ald.
   Upper half of face with whitish dust (W. I.) .. **Paraclius nigripes** Ald.
8. Hypopygium small, rounded (Mex.) ..... **Paraclius humeralis** Ald.
   Hypopygium decidedly elongated ..... 9.
9. Face of male very narrow below (Tex.) .... **Paraclius pumilio** Loew.
   Face of male of uniform width (Fla.) ..... **Paraclius scutatus** n. sp.
10. Wing of male with a rounded apical brown spot (Mex.).
    Pelastoneurus bigeminatus Aldrich.
    Wing in both sexes with several distinct brown spots ..... 11.
    Wing not spotted, or with one or two spots on the veins ..... 12.
11. Fourth vein uniformly approaching the third (Mex.).
    Pelastoneurus punctipennis Say.
    Fourth vein bent abruptly towards the third (Fla.).
    Pelastoneurus pictipennis Wheeler.
12. A spot of white pollen on the posterior part of the thorax before the scutellum (N. Y., Cal., Fla.) .... **Pelastoneurus longicauda** Loew.
    Without such spot ..... 13.
13. Antennal arista of male ending in a lamella ..... 14.
    Antennal arista not ending in a lamella ..... 15.
14. Arista of male long, tapering, thin (W. I.).
    Paraclius discifer Aldrich.
    Arista quite short, thick (E. U. S.) .... **Paraclius claviculatus** Loew.

15. Inner claw of male fore tarsus enlarged and bent so as to form a small holding organ (W. I., Mex.)..**Pelastoneurus unguiculatus** Ald.
Claw not so modified ..... 16.
16. Orbital cilia pale below ..... 26.
Orbital cilia black ..... 17.
17. Tips of hind femora infuscated above..... 18.
Tips of hind femora not infuscated ..... 21.
18. Dorsum of abdomen deep violet in color; large species (Cal., Ariz., S. D.).
Pelastoneurus cyaneus Wheeler.
Dorsum of abdomen not violet..... 19.
19. Dorsum of thorax violet (N. Y., Mass., Fla.).
Pelastoneurus lamellatus Loew.
Dorsum of thorax not violet (N. Y., Cal., Fla.).
Pelastoneurus longicauda Loew.
20. Fore coxæ black (N. Y.).....**Pelastoneurus abbreviatus** Loew.
Fore coxæ yellow, except at base (N. Y., Ill., Mex.).
Pelastoneurus lugubris Loew.
21. Hypopygium short, the lamellæ divided, forming four long filaments (Kans., S. D.).....**Pelastoneurus kansensis** Aldrich.
Hypopygium of different structure ..... 22.
22. Dorsum of thorax opaque brown, with two fine grey lines; white spots absent from transverse suture (N. Y., Ill., Mex.).
Pelastoneurus lugubris Loew.
Dorsum more or less shining, the white spots distinct ..... 23.
23. Face of male in narrowest place not one-tenth the width of the head (Mex.).
Sarcionus flavicoxa Aldrich.
Face of male much wider..... 24.
24. Face of male brown, lamellæ forked (Tex.).
Pelastoneurus furcifer Loew.
Face of male brown, lamellæ not forked (La.).
Pelastoneurus proximus n. sp.
Face of male white or whitish..... 25.
25. Thoracic dorsum deep violet in color (Fla., Ga., La., D. C.).
Pelastoneurus lætus Loew.
Dorsum only a little violet behind; hypopygium slender, lamellæ small, oval (La.)..... **Pelastoneurus parvus** n. sp.
Dorsum only a little violet behind; hypopygium thickened, the tip of the black lamella drawn out into a long, curved, black process (Quebec).
Pelastoneurus falcatus n. sp.
26. Face of male with a brown stripe in middle, sides greyish white (Middle States, Mex.....**Pelastoneurus cognatus** Loew.
Face of male not so marked..... 27.
27. Lamallæ of hypopygium triangular, the upper basal angle prolonged in a long filament, projecting outwards or backwards ..... 28.
Lamellæ of different structure..... 29.
28. Color bright green; arista plumose (W. I., Mex.).
Pelastoneurus argentifer Aldrich.
Color bright green; arista pubescent (W. I., Mex.).
Paraclius filifer Aldrich.
Color bronze-green (Mass.)..... **Paraclius vicinus** n. sp.

29. Hind femora infuscated along the entire upper edge (Fla.).
Paraclius propinquus Wheeler.
Hind femora infuscated at the tip, or not at all. ....30.
30. Face of female brown in the middle ....31.
Face of female not brown in middle ....35.
31. Fore coxæ infuscated beyond the middle ....32.
Fore coxæ not or scarcely infuscated....33.
32. Lamellæ of hypopygium straight, with rounded tips (U. S., Mex.).
Pelastoneurus vagans Loew.
Lamellæ curved, with acute tips (Cal.).
Pelastoneurus occidentalis Wheeler.
33. Arista of male long, with blunt tip (Wis., Ill., La.).
Pelastoneurus neglectus Wheeler.
Arista of male as usual....34.
34. Lamellæ of hypopygium black (Fla.).
Pelastoneurus floridanus Wheeler.
Lamellæ yellow, or mainly so (W. I.).
Pelastoneurus fasciatus Roeder.
35. Antennæ wholly black (W. I.)....**Paraclius arcuatus** Loew.
Antennæ not wholly black....36.
36. A double black spot before the root of the wing, of which the anterior part extends towards the middle of the dorsum (W. I.).
Paraclius quadrinotatus Aldrich.
Ante-alar spot not divided....37.
37. Thoracic dorsum with one or more distinct longitudinal lines....38.
Thoracic dorsum without lines ....39.
38. Thorax dark bronze-green (N. Y.).
Pelastoneurum alternans Loew.
Thorax bright blue-green (W. I., Mex.)..**Sarcionus lineatus** Aldrich.
39. Upper part of the face bright green (W. I., Mex.).
Pelastoneurus argentifer Aldrich.
Upper part of the face white-dusted....40.
40. Last section of fourth vein curved in the middle (W. I.).
Paraclius venustus Aldrich.
Same curved distinctly beyond the middle (W. I.).
Paraclius bellus Aldrich.

In the table, the section numbered 19 and 20 presents the greatest difficulty. I am unable to recognize *abbreviatus* in any of my material, and it may be the same as *longicauda*, in which the spot before the scutellum is sometimes evanescent. There seem to be some specimens of *lamellatus* in which the dorsum of the thorax is not violet but dark bronze. They may belong to a distinct species, but I cannot settle the question with my material. In other respects the table ought to work well after a little familiarity with it. *Leptocorypha pavo* Aldrich, from St. Vincent, W. I., is a near rela-

tive of *Sarcionus*. There is only one member of the genus, and it has large, elongated antennæ, and the hypopygium is yellow.

Pelastoneurus scutatus n. sp.

Male.—Face wide, in the middle with a shield-shaped brown spot, reaching entirely across; below and above the pollen is of a whitish or glaucous color. The point of the shield reaches to the lower edge of the face in the middle, and there is a projection from the middle above also; so the white is divided into four spots. Antennæ blackish, with a trace of yellow at the bases of the joints; arista feathered with moderately long hairs. Front blackish, with a steel-blue spot on each side; cilia of inferior orbit black.

Thorax rather opaque brown, before the scutellum with a violet spot; tegulæ yellow, with black cilia; halteres with brownish knob; pleuræ blackish, with little dust.

Abdomen quite uniform greenish brown in color; hypopygium black, large, the lamellæ smallish, rather narrow, black, with a few long black hairs on the edge and some finer ones on the outer side.

Legs in the described specimen with an immature appearance. The coxæ and femora distinctly black, the tibiæ and tarsi brown. In a well-matured specimen the tibiæ would probably be partly yellow.

Wings uniformly infuscated, costa not thickened, cross-vein almost exactly at right angles to the axis of the wing.

Length 3 mm.

One male, Biscayne Bay, Fla., collected by Mrs. Slosson.

Pelastoneurus parvus n. sp.

Male.—Face wide, covered with bluish white dust; palpi yellowish; antennæ yellow, the third joint large, a little longer than the others together, rounded at tip, the apical half blackened; arista plumose, with rather long hairs. Front greenish brown, dull; cilia of inferior orbit black.

Thorax rather dull green above, with distinct violet reflections near the scutellum; the sutural white spot large and distinct; usual black mark above the wing also conspicuous; pleuræ dark green, whitish-dusted; halteres and tegulæ yellow, cilia of the latter black.

Abdomen green, only moderately bright; the first segment above distinctly brighter than the rest in my specimen; incisures with faint darker bands; hypopygium elongated, rather slender, black, the lamellæ dark brown, small and rounded, with small black hairs on the margin, and still finer ones, mostly yellowish, rather abundant on the outer surface.

Fore coxæ yellow, a little infuscated at base; middle and hind coxæ with yellow tips; femora and tibiæ yellow; tarsi very slightly infuscated from the first joint.

Wings rather rounded, subhyaline; the fourth vein with bend in the middle of its last section, approaching very close to the third, and ending considerably before the apex.

Length 3 mm.

One male, Opelousas, La., from Dr. Hough.

Pelastoneurus falcatus n. sp.

Male.—Orbital cilia black, face of ordinary width, convex below and concave above in the usual form, with white pollen up to the root of the antennæ, but not very bright or silvery; palpi of the same color. Antennæ yellowish red, the upper part of the third joint infuscated; arista with the usual hairs. Color of front not observed. Thorax bronze-green, not very bright, the posterior part with a slight coppery reflection; the sutural groove at each side has the usual bright white spot (this should, in all cases, be viewed from above, the posterior end of the insect being turned towards the light), and an elongated black velvety spot lies behind the root of the wing, extending over the angle of the base of the scutellum. Pleuræ with thick grey dust; tegular cilia black, the tegulæ and halteres pale yellow. Abdomen bronze-green, the sides with only thin grey pollen in spots on the segments, the sixth segment covered with pollen; hypopygium stout, rather long, entirely pollinose except on the ventral edge, black; the lamellæ are black, with brownish hairs on the edge, and the apical angle is produced into a curved, stout, black, horn-like point, longer than the body of the lamella, rather sharp at tip, and provided towards the end with slender brown hairs, which form a distinct bunch on the inner side before the tip. The upper or inner pair of organs, called by Loew the inner lamellæ, have in this species a slender form and brown color, more yellowish at the base; they have a few slender, long dark hairs on the under side towards the tip. Fore coxæ wholly yellow, middle and hind ones black with the apical third yellow; remainder of legs yellow, the tarsi infuscated towards the tip, the front ones only on the last joint; hind metatarsus about two-thirds the length of the following joint. Wings moderately infuscated, with the third vein curving forward in the middle of its last section, thence almost straight to the margin.

Female.—Front purple or bluish purple, the face with a broad brown stripe, the upper part not very white. Thorax with a very distinct purple reflection on the posterior part; the velvety black spot on the sutural groove extends back over the root of the wing, and there is a second silvery spot, but much less bright, between its end and the spot which extends onto the corner of the scutellum.

Length 3 mm.

One male, two females, Montreal Island, Quebec, September 1 and 8, 1901 (Chagnon). The head of the male was destroyed, after it had been examined. The structure of the hypopygium is very distinctive, while the brown stripe in the face of the female occurs in only a few species.

Paraclius vicinus n. sp.

Male.—Face rather wide, parallel, covered with brown dust, the upper part showing the green ground color. Antennæ reddish yellow, the third joint slightly larger than usual, darker towards the apex, which has a blunt point; arista with only microscopic pubescence. Front bright green. Cilia of inferior orbit white.

Thorax bronze-green, without any median stripe, near the scutellum in occasional instances with a more violet tinge; scutellum bright green; pleuræ with pale greenish dust. In a side view, the dust in the sutural groove is of the same color; from above it has the usual appearance of a white spot. Halteres and tegulæ yellow, the cilia of the latter black.

Abdomen rather coppery, with a uniform covering of thin grey dust, which in side view seems more concentrated on the sides of the segments; it does not hide the metallic color to any great extent. The abdomen is noticeably robust and rather short. Hypopygium small, black, with small, black, rounded lamellæ, which, however, have a long black filamentous prolongation at the inner basal angle, usually difficult to perceive. This has a backward direction, and can usually be seen when the abdomen is viewed nearly from above.

Legs yellow, the fore coxæ scarcely infuscated at base, middle and hind ones almost wholly black; tarsi only a little infuscated.

Wings greyish, venation of the typical form with considerable concavity backward in the last section of the fourth vein.

Length 2.9 mm.

Female.—In these there is a fairly distinct median line on the thorax, otherwise no material differences.

Six males, two females, New Bedford, Mass., collected by Dr. Hough.

The species is closely related to *propinquus* Wheeler from Florida, but the latter has a distinct stripe on the thorax in both sexes, the hind femora infuscated above for the entire length, etc. Professor Wheeler's description of *propinquus* does not mention the thoracic stripe, but it is very prominent in two males that Mrs. Slosson sent me from Florida.

Pelastoneurus proximus n. sp.

Male.—Face moderately wide, with brown dust, which in some specimens is a little paler close along the lower edge; antennæ yellow, the third joint somewhat elongated, brown at the tip; arista moderately plumose. Front shining, somewhat steel-blue on the sides. Cilia of the inferior orbit black.

Thorax dark green, with the usual dark spot on the side, and white one in the sutural groove; before the scutellum with a distinct violet tinge; pleuræ black, with grey dust; halteres and tegulæ yellow, cilia of the latter black.

Abdomen bronze-green, on the sides of the segments with patches of white dust; hypopygium elongate, black, the lamellæ entirely black, rather long, a little pointed, with a thick row of slender, long blackish hairs on the edge. Above the lamellæ are two shorter filament-like organs (the "inner lamellæ" of Loew), dark brown in color, which have some slender brown hairs in one or two tufts near the tip.

Legs yellow, middle and hind coxæ about half black, tarsi very slightly infuscated.

Wings subhyaline, fourth vein bent gradually about its middle, ending considerably before the tip.

Length 2.9 mm.

Female.—Face brown in the middle, whitish along the sides; otherwise not differing materially from the male.

Five males, one female, Opelousas, La., from Dr. Hough.

Except for the lamellæ being so very different, I should have taken this for *Pelastoneurus furcifer* Lw.

PSILOPODINUS.

Bigot, Annales Soc. Ent. France, 269, 1890.
Aldrich, Canad. Ent., Aug., 1904, 246.

The genus is represented in America by a large number of species, especially in the warmer regions. Many were described by the early writers without mentioning the essential characters. When I came to work up the Mexican and Central American Dolichopodidæ for Biologia Centeali-Americana, I found it necessary to undertake a thorough study of all the American species, so far as they could be made out from the rich material furnished me, my own collection, and the descriptions. The results, as far as they pertain to the fauna in that work, will be found in Biologia, Diptera, I Suppl., 350–364, where twenty-three new species are described, and a table of species given, the old name *Psilopus* being used.

I find myself with a considerable residuum on hand, consisting of four new North American and two South American species, which for the sake of completeness I mentioned in my table, but could not publish at that time on account of their being extra limital. The descriptions are given herewith, preceded by a table of the American species known to me (*pilosus* is the only exception—I have not seen it).

TABLE OF MALE SPECIES.

1. Femora black ..... 2.
   Femora yellow ..... 35.
2. Wings with dark markings ..... 3.
   Wings without dark markings ..... 22.
3. Fore tarsi with dense black fringe on sides of 4th and 5th joints, middle tarsi with 2nd and 3d joints less broadly fringed (Mex.).
   bifimbriatus Aldrich.
   Fore tarsi of different structure ..... 4.
4. Fore tibiæ black ..... 5.
   Fore tibiæ pale, at most somewhat brownish ..... 9.
5. Face with numerous, delicate, pale hairs (U. S.) ..... **patibulatus** Say.
   Face destitute of pale hairs ..... 6.
6. Second joint of antennæ with many very long bristles ..... 7.
   Second joint of antennæ with few and short bristles ..... 8.
7. Last four joints of fore tarsus short, subequal (West. U. S.).
   pilicornis n. sp.
   These joints of gradually decreasing length (West. U. S., Mex.).
   melampus Loew.
8. The brown crossbands broadly connected on the fourth vein, leaving a round hyaline drop in the first posterior cell (Brazil).
   guttula Wiedemann.
   Crossbands not connected behind; 5th joint of fore tarsus slightly compressed, with silvery reflection on inner side (Mex.) ... **præstans** Aldrich.

9. All tarsi wholly black (Brazil) ..... **guttula** Wiedemann.
Fore tarsi wholly pale, middle ones black, with narrow silver fringe above on last two joints (Mex., Brazil) ..... **diffusus** Wiedemann.
Fore and middle tarsi little infuscated, 4th joint of latter pure white, not enlarged (W. I., Mex, Brazil) ..... **bellulus** Aldrich.
Fore tarsi infuscated, except part of first joint ..... 10.
10. Knob of halteres infuscated ..... 11.
Knob of halteres yellow ..... 16.
11. Wings with only a faint cloud, before the third vein ... **cilipes** Aldrich.
Wings with two crossbands, or at least the hind crossvein infuscated .... 12.
12. Middle and hind tibiæ entirely black ..... 13.
At least middle tibiæ largely yellow ..... 14.
13. Middle metatarsi ciliated above (Cuba) ..... **pilosus** Loew.
Middle metatarsi not ciliated above (Mex.) ..... **inornatus** Aldrich.
14. Middle metatarsi ciliated (Mex., Brazil) ..... **triseriatus** Aldrich.
Middle metatarsi not ciliated ..... 15.
15. Third and fourth joints of hind tarsi subequal, a little swollen (Mex.). **atricauda** Aldrich.
These joints of normal structure (Cuba, Jamaica, Brazil). **jucundus** Loew.
16. Apical third of fore coxa, with trochanter and base of femur, yellow (Mex.). **coxalis** Aldrich.
Not more than extreme apex of fore coxa yellow ..... 17.
17. Middle tibia with a row of small bristles on the front of the inner side, extending the whole length (Mex.) ..... **genualis** Aldrich.
Middle tibiæ with a row of stout bristles on outer side, middle metatarsus ciliated (Mex., Brazil) ..... **triseriatus** Aldrich.
Middle tibiæ with only the usual bristles ..... 13.
18. Last two joints of hind tarsus flattened ..... 19.
Last two joints of hind tarsus not flattened ..... 20.
19. Crossbands broad, including half the wing (Brazil) .... **gracilis** Aldrich.
Crossbands narrow, scarcely a fourth of the wing darkened (Mex.). **depressus** Aldrich.
20. Middle tarsi entirely infuscated (Mex.) ..... **purpuratus** Aldrich.
Middle tarsi broadly yellow at base ..... 21.
21. Hypopygium minute, appendages inconspicuous (Mex., Brazil). **similis** Aldrich.
Hypopygium large, the appendages large, flattened, black (Mex.). **atrolamellatus** Aldrich.
22. Face with abundant slender hairs ..... 23.
Face bare ..... 27.
23. Face with dark hairs (Mex., Brazil) ..... **barbatus** Aldrich.
Face with pale hairs ..... 24.
24. First joint of middle tarsus beset with crooked bristles ..... 25.
First joint normal ..... 26.
25. Tip of abdomen with a tuft of strikingly long hairs (U. S., W. I., Mex., S. A.) ..... (*caudatulus* Loew) **caudatus** Wiedemann.
Tip of abdomen with only ordinary hairs (U. S.) .... **scobinator** Loew
26. Middle tibiæ with a strikingly long apical spur (U. S.) ... **calcaratus** Loew.
Middle tibia without unusually long spur (U. S.) ..... **inermis** Loew.

27. Arista at least two-thirds the length of the entire body..... 28
Arista much shorter .....30.
28. Arista ending in a small disk, fore metatarsus not with long cilia above (Mex.).....**nobilissimus** Aldrich.
Arista plain, fore metatarsus with long cilia above .....29.
29. Appendages of hypopygium pale, middle metatarsus also ciliated (U. S.).
comatus Loew.
Appendages of hypopygium blackish, middle metatarsus plain (U. S.).
crinitus n. sp.
30. Thoracic dorsum covered with thin white dust, front densely silvery-pollinose (Mex.).. ..... **argentatus** Aldrich.
Thorax and front mostly shining .....31.
31. Costa with a row of erect cilia..... .....32.
Costa without erect cilia .....33.
32. Second joint of fore tarsus shorter than any of the following (U. S.).
(*ciliatus* Loew) **mundus** Wiedemann.
Second joint longer than any following (Mex.)..... **hirtipes** Aldrich.
33. Middle metatarsi with erect cilia above (Mex.).....**ciliipes** Aldrich.
Middle metatarsi not so ciliated .....34.
34. Middle tibiæ yellow, color of body purple (Mex.)....**purpureus** Aldrich.
Middle tibiæ yellow, color of body green (Mex.).....**forcipatus** Aldrich.
Middle tibiæ black (U. S., W. I.).....**chrysoprasius** Walker.
35. Wings with dark markings.....36.
Wings wholly hyaline .....44.
36. Antennæ yellow (Brazil, Mex.) ....**basilaris** Wiedemann.
Antennæ black..... .....37.
37. The hyaline space between the crossbands extends forward to the second vein.....38.
Hyaline space not reaching beyond third vein..... .....40.
38. First joint of fore tarsus white at tip, the following joints black, the fourth fringed above with black (Mex.)... .....**interceptus** Aldrich.
Fore tarsi plain, gradually infuscated .....39.
39. Fore coxæ black (Mex.).....**penuifer** Aldrich.
Fore coxæ yellow (Mex.)... .....**flavicoxa** Aldrich.
40. Cilia of tegulæ pale on lower half, third vein curved forward at tip (Brazil).
imperator n. sp.
Cilia of tegulæ black.....41.
41. Second and thirds joints of fore tarsus stout, swollen, bristly (Mex.).
clavipes Aldrich.
Fore tarsi plain, or only bristly.....42.
42. Fore coxæ green (U. S.).....**viridicoxa** n. sp.
Fore coxæ pale .....43.
43. Middle metatarsus with a row of erect cilia on fore side (U. S.).
scaber Loew.
Middle metatarsus plain (U. S.).....**sipho** Say.
44. Face with numerous pale hairs (U. S.) .....**flavipes** n. sp.
Face bare ....45.
45. Middle metatarsi greatly elongated, ciliated (W. I.)....**insularis** Aldrich.
Middle metatarsi plain, short (Mex.).....**tonsus** Aldrich

Psilopodinus pilicornis sp. nov.

Male.—Wholly green and black, no yellow whatever, wings with two crossbands. Face dark green, but little dusted; antennæ black, second joint with about 12 stout bristles, which are longer than the antenna itself; palpi also with quite noticeable black hairs; front dark green, with slender pale hairs on the sides, some of which have a brownish cast. Thorax dark green, pleuræ but little dusted; halteres and tegulæ black. Abdomen brighter green, a black band on the anterior edge of each segment; these bands are wider on the apical segments, and on the last two cover half or more of the width; hypopygium small, black. Legs black, the femora greenish; fore tarsi much longer than the tibiæ, first joint longer than all the rest, with a row of small hairs on the under side and some small bristles on the outer side near the end, also a small enlargement below at the tip; second and third joints short, equal, enlarged below; fourth and fifth longer, equal. Metatarsus of middle foot as long as the tibia, on the upper side a row of extremely fine erect cilia, especially distinguishable at the base. Wings with a spot in the first basal, and the usual two crossbands brown; the bands are rather small, but in mature specimens distinct; in many teneral specimens they are faint.

The hairs on the incisures of the abdomen are longer and more erect than in most of the genus.

Female.—Halteres with yellow knob, few and short bristles on the antenna and abdomen, black bands of abdomen almost wholly absent.

Length 4–5 mm.

Many specimens: Lewiston, Idaho; Craig's Mt., Idaho; Seattle and Colfax, Wash.; Cal. (Coquillett and Baron, specimens collected by the latter being received by me from the Univ. of Kans.).

The common western species, differing from *melampus* chiefly in the short joints in the male fore tarsi.

Psilopodinus gracilis sp. nov.

Male.—Face blue-green, but little dusted; antennæ small, black, the second joint with few hairs, longest above; vertex deeply excavated, with few small hairs. Thorax bright green, rounded, the sides with a light greenish gray dust, in certain lights much more white. Halteres yellow, stem whitish. Abdomen unusually slender, with broad black bands; the metallic parts of the last two segments are violet; on the last four segments more than half is black (but this is in only one specimen); hypopygium minute, black, with four finger-like projections, blackened at tip. Coxæ and femora black, the fore and middle trochanters yellow, and the fore coxæ themselves rather brown than black; tibiæ yellow, the tarsi all gently infuscated from the base. Fore femora shorter than the tibiæ, the tarsi fully double the length of the tibiæ, slender and apparently free from hairs of any size; the fore tibiæ have on the outer side some three or four small bristles; middle tibiæ longer, with about the same bristles, their tarsi once and a half their length, slender, plain; hind tibiæ yellow, but infuscated at base and tip, hairy, especially on the inner side; the tarsi black towards the end, the last three joints are slightly flattened, short, a little concave below. Wings with very broad crossbands, which include more than the apical half of the area, and entirely reach the hind margin at the apex of the fifth vein; they are connected on the fourth vein, so as to enclose a large, rather square hyaline spot in the 1st posterior cell; the anterior fork of the fourth vein runs toward the base of the wing for a distance, then makes a short but rounded turn and runs to the tip.

Tegulæ and their cilia black.

Length 6 mm.

One male, Chapada, Brazil (Dr. Williston).

Psilopodinus crinitus sp. nov.

Male.—Deep green or blue species, very bright, the bristles of head, thorax, abdomen, and fore tibiæ greatly elongated, many of them wavy toward the tips; antennæ black, the arista over two-thirds the length of the entire body, whitish at tip; appendages of hypopygium small, blackish; all coxæ, trochanters and femora black, tibiæ, except the extreme tip of hind ones, yellow; hind tarsi wholly, the others but very slightly, infuscated; fore and middle tarsi slender, elongated, the fore metatarsus with long cilia above, otherwise the tarsi are of plain structure. Wings hyaline, a faint infuscation on the anterior apical part; posterior crossvein very oblique.

Female.—Arista slender, about half the length of the body; bristles of posterior part of the thorax and scutellum of noticeable length, and those of front and middle tibiæ quite strikingly elongated; fore metatarsus with distinct small bristles above; crossvein less oblique; otherwise as in male.

Length 4–4.5 mm.

Three males, six females, Florida (Lake Worth and Biscayne Bay), Mrs. Slosson; Fla. and Lawrence, Kans., from the Univ. of Kans.

This species has a most remarkable resemblance to *comatus*, under which name I reported it to Mrs. Slosson, but differs in having small, dark (instead of large, pale yellow) appendages to the hypopygium, and in the absence of cilia the entire length of the middle tarsus.

The females of the two species are readily distinguished from all others at present known by the distinct row of hairs or small bristles on the upper side of the fore metatarsus; I have been unable to find any distinct character to separate them from each other.

Psilopodinus imperator sp. nov.

Male.—Face bright metallic, overlaid with silver pollen; antennæ small, brownish black, almost destitute of bristles; front violet, thinly pollinose in a certain light, with pale hairs on the sides. Thorax green, the scutellum and part before it of a beautiful rosaceous, running into purple; pleuræ with pure white pollen; halteres moderately infuscated; cilia of tegulæ pale on the lower half, blackish above. Abdomen slender, with rather long bristles; the basal three joints conspicuously marked with a non-metallic brown color, the incisures of the following part with moderate black bands; hypopygium small, rounded, brownish black, with two slender, acuminate, brown organs projecting forward; venter brownish. Middle and hind coxæ brown; fore coxæ and all trochanters, femora and tibiæ yellow; hind knees slightly infuscated; fore tibia with only one or two minute bristles, fore metatarsus much longer than the tibia, with a few minute hairs below; middle tarsus once and a half as long as the tibia, infuscated from the middle of the first joint; hind tibia moderately hairy on the inner side, on the outer with two small bristles; hind tarsi infuscated from the base.

Wings large and broad, with the usual two crossbands, which are connected in front as far as the third vein, which curves broadly backward in the latter part of its course, and then at the tip gently forward, in the manner typical of *Agonosoma*. Second posterior cell largely subhyaline.

Length 8 mm.

One male, Rio de Janeiro, November (Dr. Williston).

This is the specimen referred to in Kans. Univ. Quart., II, 47, as being intermediate between *Gnamptopsilopus* and the restricted genus *Psilopus*. It has four large bristles on the scutellum.

Psilopodinus viridicoxa sp. nov.

Strikingly similar throughout to *scaber*, but has the fore coxæ green, with yellow tip.

Face green, thinly white pollinose, antennæ black, small, with one or two rather noticeable bristles above on the second joint; front bright green, pollinose on the lower border, with a few pale hairs on the sides. Thorax bright green, the sides moderately pollinose; halteres yellow. Abdomen green, with narrow black bands; hypopygium small, black, with minute black appendages. Front coxæ green, the tips yellow, densely covered with white hair, and moderately pollinose with white; trochanters black, the fore ones somewhat yellowish; femora and tibiæ yellow; fore and middle tarsi infuscated from the tip of the first joint, hind tarsi wholly infuscated; fore tibia on the hind side with a row of five or six smallish bristles, ending before the tip. Fore tarsus once and a half the length of the tibia; the first joint has on the under side a row of fine hairs and a few scattered bristles; middle tibia with a row of close, erect bristles, some 30 in number, on the inner side in front; this row continues the greater part of the length of the metatarsus, and there are besides a number of scattered small hairs on the under side of the metatarsus; hind tibia rather hairy, with three small bristles on the outer side. Wings with the usual two crossbands, which are narrower than in most species, and sometimes not very prominent; apex of wing largely hyaline.

Female.—This sex has yellow fore coxæ, hence I am unable to find any available characters to separate it from *scaber* or *sipho*. I have many specimens of the three.

Length 6.4 mm.

About 40 males, Opelousas, La., April and May (Dr. Hough).

Psilopodinus flavipes sp. nov.

Male.—Face pollinose with whitish, and bearing numerous pale hairs; antennæ black, with only one or two rather long hairs below on the second joint; front bright green. Thorax bright green, the sides thinly dusted with white pollen; halteres yellow. Abdomen bright green, with very narrow bands of black; hypopygium very small, almost entirely enclosed in the abdomen, but with a pointed end directed forward. Legs, except middle and hind coxæ and their trochanters, yellow; fore and middle tarsi infuscated from the tip of the first joint; hind tarsi and tips of the tibiæ infuscated. On the outer side of the hind tibia before the middle is a conspicuously long bristle; otherwise the legs do not show any characters of importance. Wings hyaline, venation as in *caudatus*.

Female.—Face with the same hairs; middle tibiæ with two or three scattered long bristles; fore tibiæ with a few smaller.

Length 3.6 mm.

Several specimens, Brookings, S. D., and New Bedford, Mass., the latter from Dr. Hough.

This species is almost identical with *inermis* Loew, except that the male has yellow femora, like the female.

AGONOSOMA.

Guérin-Ménevelle, Voyage sur la Cowette, 1838, 293.
Aldrich, Kans. Univ. Quart., II, 48, 1893 (*Gnamptopsilopus*); Can. Ent., Aug., 1904, 246.

TABLE OF NORTH AMERICAN SPECIES.

1. Antennæ entirely black ..... 2.
   At least the basal joints yellow ..... 6.
2. Femora yellow ..... 3.
   Femora black ..... 5.
3. Fore coxæ with black bristles at tip (Mex.) ..... **infumatum** Aldrich.
   Fore coxæ with pale bristles at the tip ..... 4.
4. Base of hind coxæ and hind margin of pleura pale (U. S.) .. **costalis** n. sp.
   Base of hind coxæ and hind margin of pleura dark (U. S.).
   scintillans Loew.
5. Wings without black markings (Mex.) ..... **ciliipennis** Aldrich.
   Wings black, except apex and hind margin (Mex.) .. **dimidiatum** Loew.
6. Dorsum of thorax yellow, with a green or blue stripe ..... 7.
   Dorsum of thorax wholly metallic ..... 8.
7. Pleura yellow; middle tibiæ and metatarsi with erect cilia (W. I.).
   flavidum Aldrich.
   Pleura with an indistinct dark spot; tarsi plain (W. I.) .. **dorsale** Loew.
8. Thoracic dorsum opaque, dusted; abdomen not pale at base (U. S.).
   palleus Loew.
   Thoracic dorsum shining, abdomen usually pale at base ..... 9.
9. Middle coxæ infuscated on outer side at least to middle ..... 10.
   Middle coxæ wholly or almost wholly yellow ..... 13.
10. Costa of male ciliated, with an angular projection forward near the tip (U. S.).
    psittacinum Loew.
    Costa of male without such projection ..... 11.
11. Middle femora of male shortened, dark at base, the tibiæ elongate (U. S.).
    filipes Loew.
    Middle femora of male normal, pale ..... 12.
12. Abdomen pale at base above (U. S., Cuba) ..... **variegatum** Loew.
    Abdomen not pale at base above (Cuba) ..... **castum** Loew.
13. Fore femora with slender erect bristles below (U. S.) ..... **tener** Loew.
    Fore femora not with such bristles ..... 14.
14. Hind margin of pleura yellow ..... 15.
    Hind margin of pleura green (Mex.) ..... **mexicanum** Aldrich.
15. Abdomen above with basal yellow band, remainder green (U. S.).
    (*bicolor* Loew) **unifasciatum** Say.
    Abdomen with several bands, including the greater part of first four segments (U. S.) ..... **rotundiceps** n. sp.

Agonosoma rotundiceps sp. nov.

Male.—Face remarkably narrow, even the upper part, white pollinose; palpi and proboscis pale yellow; antennæ small, yellow, tip of third joint infuscated; front with considerable white pollen. Thorax green, not very brightly shining, with a brassy stripe or mark on each side towards the margin; tegulæ with their cilia, halteres and hind margin of the thorax pale yellow. Abdomen yellow, with green bands on the incisures, which are very narrow near the base, but wider towards the apex, the last two segments are wholly green; hypopygium small, blackish, with two long, slender, yellow filaments. Legs, including coxæ, yellow, the tarsi moderately infuscated; middle tibiæ with quite noticeable minute bristles, part of which form a scattered row on the inner side; fore coxæ with yellow bristles at tip, hind ones with a single black one on the outer side. Wings hyaline, costa not ciliated, third vein bicurved at tip.

Length 3.4 mm.

A single male, Biscayne Bay, Fla., collected by Mrs. Annie T. Slosson.

This species must be nearly related to *flavicornis*, described by me from St. Vincent, W. I. That species is known only in the female sex, and the types are not accesible, being in London. The species here described seems to have much more yellow on the abdomen, and the bristles of the middle tibiæ constitute an important distinction.

The roundness of the head is very noticeable from in front.

Agonosoma costale sp. nov.

Male.—Face and lower part of the front with thin golden pollen, not visible, except in an oblique view; with a side light, however, two round spots above the antennæ may be observed in a direct view. Antennæ black, small; cilia of the inferior orbit pale yellow. Dorsum of thorax bright green, the pleuræ a little pollinose with white; posterior edge of the pleuræ, the halteres and tegulæ, and the tegular cilia, yellow. Abdomen green, with a scarcely perceptible brownish yellow dust on the latter part; first segment with a yellow crescent above, and the venter yellow on its basal third; hypopygium minute, embedded, only a pair of minute dark appendages visible. Fore and hind coxæ yellow, middle ones infuscated more than half the length; femora and tibiæ yellow, the fore tibiæ with no bristles, except a minute one near the base on the outer side; tarsi plain, infuscated from the latter part of the first joint. Wings with a yellowish tinge, the costa somewhat thickened and ciliated to the end of the second vein with close, stout, erect cilia, which do not decrease in size, but are rather large towards the end. There is a peculiar and very conspicuous crook in the costa before the end of the second vein, making a notch in the wing, in which are several much longer hairs, standing at an angle with the surface of the wing. The segment of the fourth vein from the hind crossvein to the fork is more than double the length of that from the fork to the margin.

Female.—Costa entirely destitute of any cilia; pollen of front yellow, but very difficult to perceive, that of the face also very indistinct, but more whitish.

Length 3-4 mm.

One male, two females, Tifton, Ga., June 8 and 11, 1896; collected by Dr. Garry de N. Hough.

NORTH AMERICAN TORTRICIDÆ.

W. D. KEARFOTT, MONTCLAIR, N. J.

Genus **POLYCHROSIS** Rag.

This genus was enacted by Ragonot* for the reception of the European grape-berry moth *botrana* Schiff, and this species was made the type of the genus. Ragonot, however, omitted to give the generic characters, and as, so far as I am aware, no one else has done so, I add them below.

In 1871 Zeller† identified the American grape-berry moth as *botrana*, and all subsequent workers in this family have followed his conclusions; and in addition have lumped under this name a number of moths whose larvæ feed on very dissimilar food plants.

These identifications can perhaps be accounted for by the reason that all of the species are superficially alike, especially if slightly rubbed, and that seems to be the condition of the majority of the museum specimens I have examined.

With sufficiently long series of perfect bred specimens, however, it is easy to differentiate and even place the rubbed ones where they belong. During the past four years I have been successful in breeding a goodly number of moths from different food-plants, which will be referred to later. The most valuable assistance has been given by Prof. M. V. Slingerland, who has bred large numbers of the grape berry moth from each of its three broods and most kindly permitted me the free use of all the species lumped under this name in the Murtfeldt collection, which is deposited at Ithaca. I am also indebted to him for opportunity to study a number of European specimens of *botrana*, secured through Staudinger and Bang-Hass, and most important he has been good enough to make the beautiful photographs, which are reproduced on Plate XIX.

About twenty specimens were loaned by the National Museum, bred from several food plants and from widely separated localities.

From a very careful study of all of this material I am convinced the American grape-berry moth is specifically distinct from the European, the name *botrana* for our American form most therefore fall, and be replaced by *viteana* Clem.‡

* Ann. Soc. Ent. Fr. lxiii, 208, 1894.

† Stett. Ent. Zeit. xxxii, p. 179.

‡ Proc. Acad. Nat. Sci. Phila. p. 359, 1860.

It is not at all unlikely that the European *botrana* will be at some time introduced in this country with imported grape vines, and obversely *viteana* may become a native of Europe. But, so far as I have observed, not a single specimen of the real *botrana* has been taken or bred in America. For the sake of comparison it is included in the synopsis and an description added, and for the same reason it will do no harm to have the name awhile longer in our lists.

It is rather peculiar that *botrana* is not recorded from Great Britain—this may be partly accounted for by the reason that most of the grapes grown in England are under glass—but it is hardly a sufficient explanation and the fact that a species common in the south of Europe should pass by England entirely and yet be found abundantly in our Northern States is of a much better argument for the separation than the lumping of the two forms.

The outline of the wings of all the American species here treated differ quite markedly from the European, as can be observed on Plate XX.

In Clemen's original description of *viteana*, it is stated that the larva feeds on the fruit of the grape in September and on the fruit of the wild raspberry in July; Clemens also cites sassafras as the food-plant of another specimen, which was not distinguishable, except from difference in color. The majority of Clemen's types are in the Entomological Section of the Academy of Natural Sciences, Philadelphia, in a remarkably good state of preservation, and among them are two specimens of this species, one is undoubtedly an American grape berry moth and compares exactly with the long series bred by Mr. Slingerland. The second specimen is two badly rubbed for identification. Dr. Packard* says there are two broods of the insect, both on grape. Dr. Saunders† gives a very good figure of the American species and states that there are two broods, the last in the grape-berry and the early brood in young shoots of *vernonia* and on the tulip-tree. Prof. John B. Smith‡ names thistle, grape, rose and sassafras as food plants.

In the U. S. Nat. Mus. collections are specimens bred from grape-leaves, grape berry, *liriodendron tulipifera*, *Vernonia noveboracensis*, seeds of *Rhus* and several specimens without names of food-

* Guide to the Study of Insects, 336, 1869.

† Insects Injurious to Fruits, 298, 1892.

‡ Insects of New Jersey, 493, 1899.

plant. In the Murtfeldt collection are specimens bred from grape-berry, seeds of *Ambrosia trifida* and seeds of *Rhus*.

Prof. Slingerland's investigations into this subject have resulted in abundant series of the fall or grape-berry brood, the first spring brood on the flowerets and recently set grapes and the middle brood in the green grape berries. Prof. Slingerland has been successful in discovering and breeding considerable series of both, the mid summer and fall brood on the American wild-grape, which specimens compare exactly with *viteana*. In my own collection are specimens bred from *Liriodendron*, *Vernonia*, *Eupatorium* and swamp magnolia.

After critical examination of all this material, over 100 specimens, I feel very positive that each of the food plants support a good valid species, that the different broods do not affect different plants, but that the entire circle of each species is confined to a single plant. This is particularly well illustrated by Prof. Slingerland's work, and in a very much smaller way by my own. In Staudinger's and Bang-Haas Catalogue are twenty species under this genus; we have been satisfied to lump all of ours under one name and that a foreigner.

For want of sufficient material I do not propose to make as many species as we have recorded food plants in this paper, but hope at some later time to be in possession of good series from all the broods from each plant, which will warrant such separation.

POLYCHROSIS Ragonot.

Polychrosis, Rag. Ann. Soc. Ent. France, lxiii, 208, 1894.
Polychrosis, Rag. Staud. and Rebel Catalog Lep. des Pal. Faun. ii, 109, 1901.
Polychrosis, Rag. Fern. Bull. No. 52, U. S. N. M. 449, 1902.

Antennæ in ♂ shortly ciliated, palpi short, do not extend beyond face, outer joint very short, obtuse, tufts on second joint closely compressed, truncate. Thorax with bifid, posterior crest, loosely scaled.

Forewing:—Costa evenly arched, apex rounded, outer margin oblique, very slightly rounded; 1b strongly furcate at base; 1c reaching to and almost concurring with 2; 2 arising from three-quarters of cell; 3 and 4 not connate but arising closer together than 4 and 5; 3 bent sharply and 4 slightly downward beyond origin; 5, 6 and 7 arising at equal distances; 4, 5, 6 and 7 to margin at nearly equal distances apart; 7 to margin below apex, 8 and 9 arising close but not connate; 10 and 11 widely separated from each other and 9.

Hindwing:—With frenulum; uncas not developed; median vein hairy above near base; costa slightly arched to middle, slightly sinuate beyond; apex rounded; outer margin slightly rounded; dorsum same but sinuate between 1b

and 2; 1b furcate at base; 1e indicated by a slight fold or thickening; 2 from two-thirds; 4 arising closer to 3 than 5, all separate; 4 and 5 parallel; 6 and 7 connate.

From a European ♂ specimen of *botrana* Schiff. from Staudinger and Bang Hass, through the courtesy of Prof. M. V. Slingerland.

Synopsis of Species.

1. With large outer marginal patch of front wing indented above anal angle by a spur of ground color.....2.
   With this patch evenly rounded on outer edge; not indented below. **botrana.**
2. With inner half of front wing uniformly lilaceous or leaden-blue, crossed by well-defined narrow brown lines.....3.
   With inner half much mottled with reddish brown or grey.....4.
3. With ground color of outer half of front wing rich ochreous-brown. **liriodendrana.**
   With ground color of outer half of front wing pale yellowish brown. **viteana.**
4. With dark color of central fascia of front wing extending to dorsal margin. **rhoifructana.**
   With this dark color concentrated about and above middle of wing and not reaching dorsal margin..... **slingerlandana.**

Polychrosis botrana Schiffermüller.

Tortrix botrana, Schiff, Syst. Verz. Wien, 131, 1776.

Head:—Caps above eyes, the long scales of which meet at upper side of head, very pale brown, flecked and spotted with darker brown, the same color on outer and under sides of palpi. Face and outer sides of palpi whitish yellow or cream color. Eyes large, round and black. Antennæ annulated with cream color and brown.

Thorax:—Front half and shoulders of patagia, dark brown, merging into cream color, overlaid with brown scales in middle of thorax and ends of patagia. A tuft of long raised scales on posterior end of thorax dark brown, almost black and mixed with a few cream-color scales.

Forewing:—Whitish grey, replaced by pale lilaceous grey between fold and dorsum, below costa between half and outer fourth and a small subapical patch. One narrow band at inner fourth and a broader band at middle, of pale olivaceous-brown, interrupted by patches of black scales. A small triangular spot at apex, a large one before apex, two between the latter and the middle fascia, and three on costa between apical spot and fascia, of this same color.

Base:—Whitish grey, mixed with pale fuscous and lilaceous scales, with a few black scales on costa just at junction with thorax, and a few more forming a V-shaped mark on median line, with point of V touching thorax. Just beyond base begins a line or narrow band, black on costa to median vein, thence swelling out in a wide semi-circle to dorsum, black scales replaced at median by light brown, the same color where it touches dorsum. Between basal line and inner fascia whitish grey, with tips of scales darker or light fuscous, below median two small patches of lilaceous scales, each with a few black scales outwardly, and a small black spot on costa. Inner fascia at inner fifth, almost vertical, broad on

costa, contracted on both sides a third below costa, broadening out below, and again contracted at dorsum. Color as stated above, black scales on each side of fascia on costa, a ring of black in middle and a small spot on dorsum, with two dots just above it on outer edge of fascia. This fascia is broken by a narrow whitish line that begins just beyond base, over the vein 12 and disappears at middle fascia. Space between inner and middle fascia, whitish grey, this color outlining edges of both fasciæ, edging costa and dorsum, and a streak paralled to and above fold with a narrower streak half-way between latter and costa. Between these whitish streaks color is lilaceous. Two geminate dots on costa fuscous-brown. One geminate and one single black dot on dorsum and three black dots between costa and dorsum, one just below vein 12 touching inner fascia, the other two on outer margin, one a quarter below costa and other a quarter above dorsum. Middle fascia same width on costa as inner fascia, at upper median line broadening outwardly to twice this width, with a right angle spur at middle, of about same width, pointing towards apex, ending abrupting, from lower point of this projection the band sharply contracts to the same width as on costa, at about a quarter above dorsum, below this is a short rounded outward projection, another acute contraction, then a slight swelling and the outer line rounds into the dorsum, where it is narrowest. Color bright olivaceous-brown, the black scales are concentrated in a solid mass occupying all of the fascia between middle of cell to costal vein, involving all of the first outward process and the middle spur. A few black scales at costa on each side of fascia, a short streak of black on fold, a dot on dorsum and a short line and two dots in middle of fascia. A narrow band of ground color runs from fascia, paralleling costa, bending down before apex and ending in a triangular spot on outer margin below and defining apical spot, from this band four rectangular spurs touch costa, defining brown costal spots, the width of spurs and costal spots are about equal. About the middle of this band it joins a vertical band of ground color, slightly wider than the subcostal band, and at a third below costa separating into three branches, the upper branch curves to middle fascia and coalesces with subcostal band, outlining a small diamond spot of brown; the second branch reaches dorsum just beyond fascia, and is sharply indented on both edges above dorsum, the third branch, on outer edge, goes directly to inner angle, with outer edge branching at right angles and ending on outer margin at and above angle. These ground-color bands and branches are partially heavily overlaid with lilaceous-fuscous and lilaceous-blue scales, the former on second branch of lower band and latter on the whole of the subcostal band, more intensely at its inner and outer ends. The four spurs that touch costa are tipped with white on inner and two outer ones, and in each is a small dark costal dot. Two black dorsal dots in second branch and three or four single black or brown scales in central portion, which is the whitest; and a small dark dot on margin. Of the three costal brown spots the first beyond costa is almost entirely overlaid with black, the middle one less so and the outer only black on costa, the apical is larger than the costal spots, is right angled on the basal and dorsal sides, and rounded, following curve of apex outwardly, it is smoky brown, with a black dot in angle. Below is a large semilunate olive-brown patch, inner margin vertical, slightly indented above, straight below, and outer margin evenly curved, touching outer margin from a little above angle to slightly above middle. Evenly shaded smoky brown, several black scales on outer edge. Cilia light brown or fawn, becoming smoky black at and above apex, divided by a paler line.

Hindwing:—Very pale fuscous or whitish, shaded with darker fuscous outwardly; cilia whitish, proceded by a dark fuscous line Abdomen fuscous above, paler beneath, anal tuft ochreous. Legs dark fuscous, annulate with white. Expanse 12 to 13 mm.

From ♂ and ♀ European specimens.

Botrana is different from all of the American species in having the large subterminal patch rounded outwardly and resting against the lower half of the outer margin, while in *viteana* and allied species this patch is distorted and broken by spurs of ground color; in all the American species a well defined spur enters the patch just above the anal angle, in some species separating the patch from the outer margin. *Botrana* is a much paler or generally lighter colored species than *viteana*. The basal area and inner half ashy grey, crossed by narrow olive green fascia at first quarter and two short ones from dorsum before it. The olive-green central fascia is not unlike an outline map of South America, with Brazil pointing towards apex, but with stem that would represent the Isthmus going vertically to costa. The hindwings are very much paler than *viteana*.

Polychrosis viteana Clemens.

Endopiza viteana Clem., Proc. Acad. Nat. Sci. Phila. 359, 1860.
Carpocapsa vitisella, Rathvon, Prac. Farmer, p. 170, 1868.
Penthina vitivorana Pack., Guide Study Ins., 336, 1869.

Head, thorax, palpi light brown, specked with darker brown, lower and outer sides and tips of palpi and posterior thoracic tuft dark brown.

Forewing:—Ground color, lilaceous-blue, middle fascia and large spots brown, overlaid with much black. Costal spots lighter brown. A dash of white about middle of outer third.

Base to middle fascia lilaceous-blue, inner fascia almost obsolete, represented by a narrow band of black scales, each fringed with light brown, from dorsum but not reaching costa by a quarter, three small spots and two small ones between them of brown-black scales on costa before middle fascia. And in the same space on dorsum four black dots, the dorsal margin narrowly overlaid with light fuscous, brown and black scales, causing a mottled appearance.

The middle fascia is evenly convex on its inner edge, and is of almost even width throughout, except at about middle of wing, the outer edge curves downward and outward at right angles to the band, and then turns abruptly upward to costa (in the curve thus formed rests the white oblique patch) from outer end of this branch the outer line of fascia continues inwardly oblique to costa, slightly indented, the lower half of fascia triangular. Color smoky-black on upper half, a small patch of same at one-third above dorsum, otherwise smoky-brown, lightest at dorsum. Before anal angle is a triangular brown spot. Above the angle an irregular rounded blotch of brown and black, indented at its lower outward corner by a spur of the ground color, its outline also broken by a spur of ground color on its outer upper edge. Apical spot flatly triangular. Ground

color of costal margin between fascia and apex, whitish blue, four brown costal spots in this space, the inner a mere outwardly oblique line curving into outer lower end of second spot, latter and fourth are triangular-oblique, third spot rectangular. Below these spots and above the white patch are scattered a few brown scales. Cilia bluish grey, darker at apex and light fuscous at anal angle Underside dark fuscous, whitish below fold, three geminated whitish spots on costa before apex, and a number of others on extreme edge of costa only, between these and base, cilia darker with narrow light subciliate line.

Abdomen smoky black, with metallic reflection, anal tuft silvery-white above, yellowish beneath, tipped with dark fuscous; underside abdomen whitish; legs same inwardly and between joints, outwardly smoky-black.

Hind wing:—Smoky fuscous, lighter towards base, darkest at apex, cilia paler; underside fuscous.

Larva:—9 to 10 mm. Cylindrical, rather robust, tapering from 4 to head and 8 to anal segment. Pale olivaceous-green, with a reddish or purplish tinge from food. Head flattened, slightly bilobed, luteous green on upper parts of lobes, discolored by brown in front; mouth parts and a horizontal dash on side of each lobe below middle black. Pro-thoracic shield large but narrow, luteous brown, bisected by pale green dorsal line. Thoracic feet black, green between joints. Tubercles plates moderate, a slight shade darker than skin, shining. Anal plate not chitinous.

First brood complete, from hibernating pupæ of the complete third and partial second broods; issues in May and deposits eggs in the flowers of the grape, larvæ feed on recently got berries. Second brood not complete, part issuing middle of July and depositing eggs on half grown grapes, but some of the pupæ of this brood hibernate and do not issue until the following spring; this habit has been observed on both the cultivated and wild grape specimens. Third brood complete, issuing latter part of August and ovipositing on yearly full size grapes, larvæ completing growth and in pupæ by the latter part of September. Pupæ of all broods formed in a neat little flap or envelope cut out of edge or internal part of a leaf.

The ground color of *viteana* and the inner half specially well defined, is a leaden blue or lilaceous-blue, crossed by a narrow chocolate brown line at first quarter. The central fascia is more slender than *botrana*, its outer spur is sharply produced and in some specimens turning upwards towards costa and almost joining submarginal patch. Apical spot is larger and the costal spots before it are smaller than in *botrana*. Hindwings dark brown.

Polychrosis liriodendrana sp. nov.

Head, palpi and thorax light brown, or fawn color, tips of palpi and outer ends of scales forming posterior dorsal tuft dark brown. Antennæ dark fuscous, narrowly annulated with light brown.

Forewing:—Greyish blue, dorsal patch, narrow inner fascia, middle fascia and spots on outer third light brown.

Basal patch barely touches costa, obliquely to dorsum, involving one-fifth of latter, indented twice before median line, light brown at extreme base and blackish fuscous outwardly. The outer edge of inner fascia straight, oblique to fold, thence inwardly oblique to dorsum. On its inner edge it is less distinctly defined, the ground color overlapping it above the fold, below the fold it nearly coalesces with dorsal edge of basal patch, beginning at the fold, in the inner edge, a narrow dash of black scales points towards dorsum. The central fascia is roughly triangular, the inner edge nearly straight and slightly oblique, the outer edge points towards angle for half its length and then obtusely turns obliquely inward to dorsum, color light brown, clouded with dark brown directly on and a quarter below costa, a small black dot on outer margin at widest part; outlined on both sides, except the upper quarter, by whitish scales. Triangular anal angle brown spot lightest towards base, and dark brown running into smoky black at angle and in cilia. Large marginal patch is diamond shape, almost evenly colored dark brown, a narrow line of dark blue or black scales separating the upper part from margin. Above this the costal and apical spots of brown almost exclude the ground color, being separated from each other by narrow whitish bands, through the centre, of which run short narrow lines of blue-black scales. There are but three large costal spots, the inner the largest, roughly rectangular, with an outer spur running towards and almost joining the large marginal patch, the apical spot oblong, slightly pointed at upper and lower ends, light brown on costa, darker below, with an irregular vertical line of blue black scales. Lines of these same scales completely surround it, except where it touches costa, and a short space at apex. The two costal spots between the above are rectangular and less than half the size of the apical spots. Between these four spots short lines of blue black almost touch costa. On costa between middle fascia and first large spot is a small brown dash, with whitish scales on each side, between inner and middle fascia, on costa is a small brown dash and beyond it a small elipse of dark bluish scales, between them the scales are a shade paler than the ground color. Cilia light brown, shaded with smoky fuscous at apex, middle and anal angle, tips of scales white.

Underside smoky-fuscous, with six geminated whitish costal spots. Hindwing pale fuscous internally, becoming smoky-brown outwardly, darkest at apex, cilia paler; underside evenly pale fuscous, with a few dark scales at apex. Abdomen smoky-brown above, pale fuscous beneath, tuft on 12 yellow, on 13 white. Legs whitish, annulated with dark brown. Expanse 11.5 to 12.5 mm.

U. S. Nat. Mus., type No. 8150.

Bred from *Liriodendron tulipifera* L. Second or mid summer brood, larva July 2nd, pupa July 9th, issued July 21st, Montclair, N. J. July 10th to 18th, Washington, D. C. In N. M. are several specimens of third or winter brood, No. 149, also May 7, 1883. I have collected larvæ of this last brood as late as October 15th. The habit of the two broods observed is to spin a narrow text along one side of mid rib, close to the base, as larva grows this tent is extended

outward, increasing in width, until it may finally involve a lobe of the leaf.

The larva is well sheltered under this protection, and in a few cases I have found the mid-rib excavated for half an inch or more, the larva retiring into this tunnel when disturbed. The first spring brood may be looked for on the flowers as well as the leaves of the tulip tree. All of the cocoons observed have been made by cutting out and turning over a flap in side or middle of leaf.

Larva 10 to 11 mm. Cylindrical, less robust than *viteana*, slightly tapering, sordid green. Head yellowish brown, ocellic field and lateral dash on lobes black; mouth parts are slightly darker than head; pro-thoracic shield dark brown, thoracic legs black. Anal shield not chitinous.

This is the largest of the American species I have observed. It can easily be separated from others by the rich ochreous color of ths outer half and particularly the apical portion of wing. The subterminal patch is smaller than either of the two preceding species, and is nearly square or diamond shape with points vertical. The costal spots are rectangular in shape.

Polychrosis slingerlandana sp. nov.

Head pale brown; palpi same, darker outwardly, thorax same, sprinkled with dark brown dots, on thoracic tuft the dark brown almost hide the lighter color, except at tips; antennæ pale brown, annulated with dark brown.

Forewing:—Yellowish brownish-fuscous. Basal patch covering inner fourth of wing, brown, heavily overlaid with dark purplish brown, dark color concentrated on costa and dorsum at base and outer margin of patch. Patch is defined by narrow yellowish fuscous line, running obliquely from costa to median, then angled sharply downward to dorsum. Beyond this the outer portion of wing is a mottled mass of yellowish fuscous, brown and dark brown scales, with a few grey and white. There is no well-defined pattern as in the *grape* and *liriodendron* species. Beyond basal patch is an obscurely defined lighter fascia, broken on costa by a geminate central dark spot and a single spot on each side, the upper half of fascia partly overlaid with dark grey and lower half with yellowish fuscous. On the median line the fascia is interrupted by a horizontal black streak, which continues to end of cell and terminates in a small round dot, two other dots the same size are on the upper side of streak, with the spaces between equally divided. From the outer dot an irregular brown line runs obliquely inward, becoming more black than brown when it reaches dorsum at middle. The space enclosed by this line and horizontal streak is dark brown above and lighter below. A dark cloud on dorsum before angle, and between it and brown oblique line are a few scales of grey. Beyond it, before marginal patch, is a much broken band of grey scales from angle to median. Marginal patch large, semi-ovate from costa to angle, touching margin from middle to angle, inner edge nearly straight, where it touches costa it is light brown. Shading into very dark brown to middle and below middle lighter, in the lower half are two small round black spots,

vertical to each other, and above them in middle of edge of patch a third spot. The lower half of this patch is outwardly bordered by a narrow black line before the cilia. Beyond dark upper half of patch a faint brown line, interrupted by three whitish dots, and a fourth whitish dot beneath a black small apical spot, between the latter and cilia light brown. A generally paler triangular patch covers costa from just before middle to nearly to apex, bounded inwardly by darker fascia and horizontal dark median streak and outwardly by the generally darker submarginal space. This lighter area, inwardly below costa, is overlaid with a few grey scales, below which is an irregular patch largely mixed with whitish scales. On costa the light space is broken by two equally-spaced shades of darker scales, before the inner shade are two small dots of black. Cilia slaty-grey, outwardly shaded with light fuscous on lower half.

Underside:—Dark smoky-fuscous, veins darker, eight geminated whitish spots on costa; cilia fuscous, with a narrow subciliate whitish line; all the surface below the fold is whitish. Hindwing smoky-black, not shaded. Cilia paler. All surface above vein 8 whitish. Expanse 8 to 9 mm.

U. S. Nat. Mus., type No. 8151.

Bred from *Eupatorium perfoliatum* L. Larva July 6th and 9th, pupa July 15th to 20, issued August 2nd to 9th, Montclair, N. J. I have taken the larvæ of what I believe is the same species about the middle of September, but failed to carry them over the winter. Mid-summer brood tunnelling a passage in the young flower heads, slightly silk lined. The fall brood on the mature flower heads and soft seeds, tunnelling as with second brood. The spring brood can be looked for in young terminal leaves.

Larva 8 to 9 mm. Cylindrical, more robust than *viteana*, slightly tapering, olive-green. Head flattened, chestnut-brown; mouth parts darker brown, ocellic field, lateral dashes, thoracic feet dark brown. Pro-thoracic shield light chestnut brown, darker shaded on posterior edge. Tubercular plates moderate, nearly concolorous, shining. Anal shield not chitinous.

This and the following species are of a different style of ornamentation than the preceding. The ground of *slingerlandana* consists of a mottled mass of ochreous and brown, the lilaceous shades are almost obsolete; the fasciæ and spots are also very illy defined and are almost lost in the prevailing color. Hindwing very dark, smoky-black.

Named in honor of Prof. M. V. Slingerland, of Cornell Experiment Station, whose important economic investigation in the habits of the grape-berry moth, the results of which will shortly appear in a special bulletin, has been the stimulus for the present paper.

Polychrosis rhoifructana sp. nov.

Head and palpi yellowish brown, thorax darker brown. Antennæ dark fus-

cous, with narrow lighter rings between joints. Eyes black, with greenish reflection.

Forewing:—Basal patch large, occupying inner quarter of wing, mottled mass of smoky-black and lilaceous scales, the black forming an irregular fascia through centre of patch and also another on outer margin of patch, the scales of latter at dorsum becoming brown. Four black dots and four whitish dots on costa within this space, outer line of patch outwardly oblique, irregular and with an acute tooth projecting outwards at fold. Beyond basal patch is a broad whitish fascia, cream and yellowish scales on costa and lower half and lilaceous scales on upper half below costa, one large and two small black dots on costa and several black scales over the lilaceous area. Outer edge of fascia nearly straight. Beyond is a broad dark fascia narrow on costa and dorsum, but swelling out at middle in width equal to a quarter of length of wing; smoky-black scales in upper half, changing to yellowish brown on lower half. Beyond and outlining this is a very irregular whitish fascia, broad on costa and to middle of wing, then contracted and broadening out again to dorsum, where it reaches to anal angle. On costa, in middle of this fascia, is an oblong streak of smoky-brown scales, and a small rounded spot of same on dorsum, a few other dark scales are between these two spots. Submarginal patch is large and touches margin only at middle, smoky-brown, darkest at upper end; inner edge nearly vertical, outer edge evenly rounded, except at lower quarter where it sharply broken or indented by a round whitish spot, having a lilaceous center. Apical spot smoky brown, with cluster of darker scales in center; separated from submarginal patch by line of whitish and lilaceous scales. Three brown costal spots between apex and outer light fascia. Cilia smoky-fuscous, mixed with bluish lilaceous, with a narrow dark inner line. Hind wind dark smoky-fuscous, cilia lighter. Underside of both wings smoky fuscous, with fascia and costal spots of upper surface of forewing repeated in lighter and darker shades of fuscous. Abdomen above smoky-fuscous, tuft yellowish brown, below paler fuscous. Legs fuscous, ringed and spotted with dark brown. Expanse 10.5 to 11.5 mm.

U. S. Nat. Mus., type No. 8152.

In other specimens bred from Sumac the contrast in the whitish and dark brown fasciæ are not so pronounced, caused by the deplacement of the whitish scales by lilaceous or brown. In fact I have very strong doubts of the authenticity of the records of these particular specimens. (Riley, No. 5492, Dept. Agri.) The probabilities are that grape and sumac larvæ have been mixed under this one breeding number.

I have not bred this species, and of the nine specimens before me all are from the hibernating brood, dates of issue December 28th, January 9th, January 28th and March 6, Nos. 3342 and 3343, Insectory, Wooster, O., Murtfeldt collection; January 2nd, January 12th, January 29th, No. 3257, Nat. Mus.; and May 16th and 17th, No. 5492, Nat. Mus., near Rochester, N. Y. All except last two were doubtless forced, leaving middle of May as natural date of

emergence. In Prof. C. V. Riley's unpublished notes at Dept. Agriculture, Washington, No. 5492, is supposed to be the same insect mentioned by Packard, p. 665, Fifth Report U. S. Ent. Com., as a "Sumac Leaf Roller," this is an error, as the larvæ mentioned by Packard produces *Episimus argutanus* Clem.

The following additional specimens have been bred, the records will no doubt be of service to future workers.

On *Vernonia noveboracensis* L. (iron weed.) In flower heads, tunnelling and lining galleries with thin silk, larva July 27th, issued August 9th, Caldwell, N. J. No. 3557, Nat. Mus., issued May 22d. Another Nat. Mus. specimen bears a small label "From *Vernonia* June 15, 80," and a large label "A small *Gelichid.* This "is a ♀ of a species of *Gelichia* allied to *Evapora apicidripunctella* "Clem. (signed) Walsingham 1886"—of course, a wrong determination. One specimen, Murtfeldt coll. "No. 3557 Iss. May 12," and another Murtfeldt specimen with this label "Larva ⅛ inch long, "livid dark brown, head fuscous, piliferous spots glassy, hairs rather "long. Very active, feeds in young shoots of *V. nove.* In chang- "ing to pupa forms a small cylindrical case from a bit of leaf, iss. "July 3, 79."

I have taken larvæ in flower heads and seeds of *Vernonia* betweed middle and last of September, which I think are this species, but failed to carry them through the winter. The moth is very close to *slingerlandana*, but a series of perfect bred specimens are necessary to define the differences.

On *Ambrosia trifida* L. (horse cane, great rag-weed). One specimen, Murtfeldt collection, "From larva feeding in seeds of *A. trifida*, Apl. 25, 1884." This is allied to *rhoifructana*, but seems distinct.

On *Magnolia virginiana* L. (swamp or laurel magnolia). One specimen, Dist. Col. Larva August 1st, pupa August 7th, issued August 15th. Larva in mid-rib tent on underside of leaf, pupa in flap cut out of edge or interior of leaf. August 1st, near Moorestown, N. J., in a swampy piece of woods. Nearly every magnolia leaf showed the work of this larva, including the tent and cocoons, each of latter with empty pupal shell projecting from it. Unfortunately no live specimens were to be found.

Also reported as bred from Sassafras, wild-raspberry and thistle. I have not seen any of these specimens, and have no doubt that a number of others will be found in other food plants, as soon as a

determined effort is made to secure them by breeding. It is rather notable that almost no flown specimens are to be found in any of the large collections. I have two taken at Anglesea, N. J., May 25th at light. The moths are quite small and obscure looking, and it is probable they are not easily disturbed in the daytime, hence their apparent rarity, but they can be bred with very little effort, and I believe will eventually be found to be very common and widely distributed.

At the present time (October 15) I have in pupæ most of the above species as well as others that I believe to belong to this genus from a number of food plants.

EXPLANATION OF PLATES.

PLATE XIX.

Fig. 1-2.—*Polychrosis botrana* Schiff.
" 3. " *rhoifructana* Kearf.
" 4. " *slingerlandana* Kearf.
" 5. " *viteana* Clem.
" 6. " *liriodendrana* Kearf.

PLATE XX.

Fig. 7-8.—Venation, *Polychrosis botrana* Schiff.
" 9. " " *viteana* Clem.
" 10. " " *liriodendrana* Kearf.
" 11. " " *slingerlandana* Kearf.
" 12. " " *rhoifructana* Kearf.

1—P. BOTRANA SCHIFF.
(EUROPE)

4—P. SLINGERLANDANA KEARF.

2—P. BOTRANA SCHIFF.
(EUROPE)

5—P. VITEANA CLEM.

3—P. RHOIFRUCTANA KEARF.

6—P. LIRIODENDRANA KEARF.

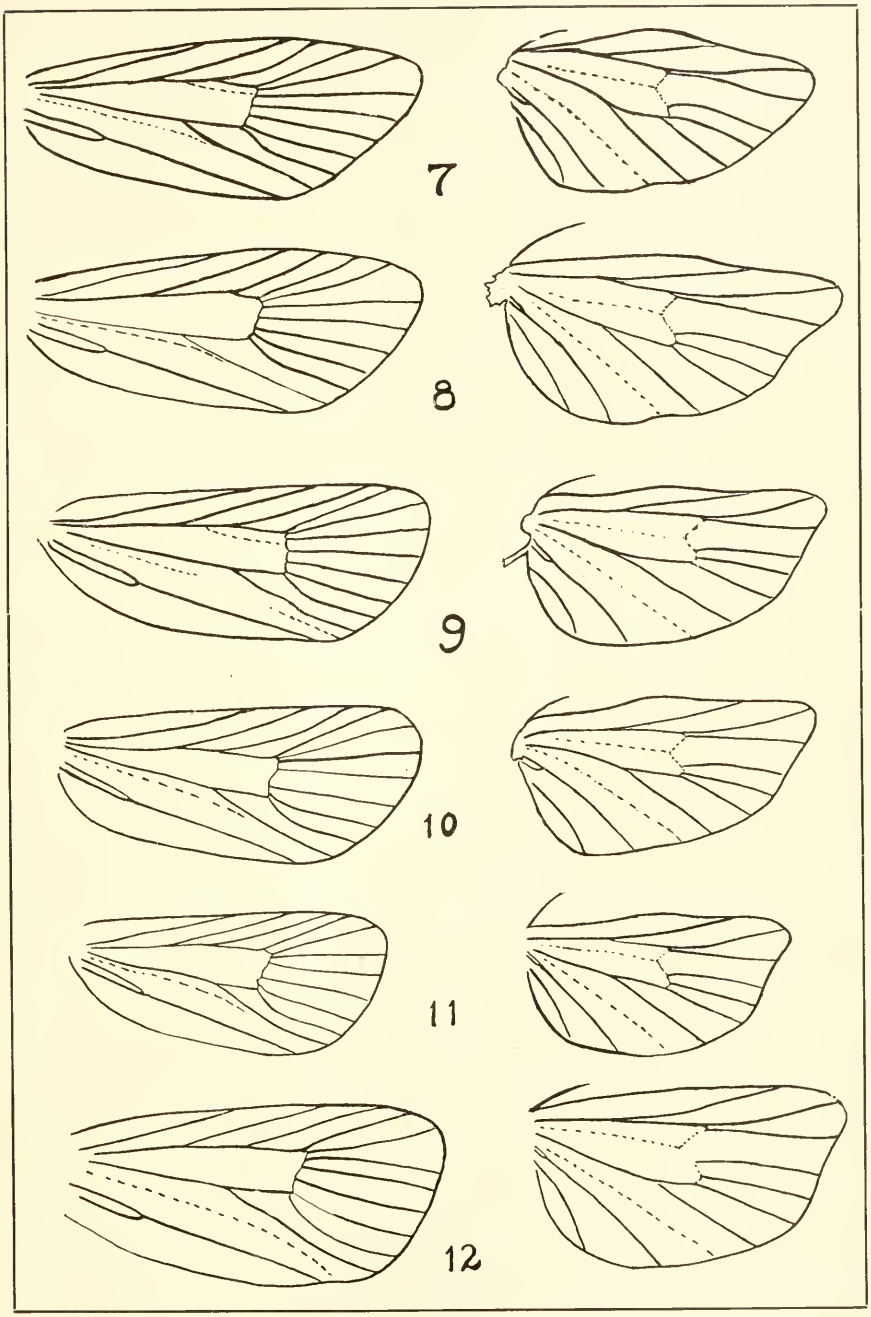

FIG 7.—POLYCHROSIS BOTRANA SCHIFF.
FIG. 8.— " " "
FIG. 9.— " VITEANA CLEMENS.
FIG. 10.—POLYCHROSIS LIRIODENDRANA KEARF.
FIG. 11.— " SLINGERLANDANA KEARF.
FIG. 12.— " RHIOFRUCTANA KEARF.

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